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(56) Documents Cited:
GB 2276597 A **NL 008403751 A**
US 6360571 B1 **US 4622833 A**

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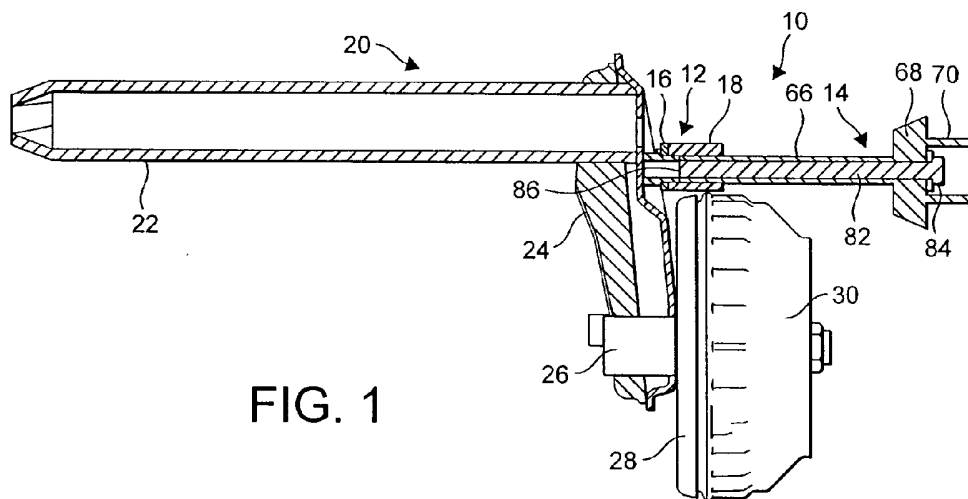
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INT CL⁷ **B60R**
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(54) Abstract Title: **Towable vehicle security apparatus**

(57) A towable vehicle security apparatus (10,100,120) comprising a base (12) securable to a suspension component (24) of a towable vehicle chassis and a locking assembly (14) releasably securable to said base (12), the locking assembly (14), in use, being positionable through an aperture of a wheel of the towable vehicle to prevent the rotation of the wheel relative to the suspension component (24) to which the base (12) is secured.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The print reflects an assignment of the application under the provisions of Section 30 of the Patents Act 1977.

Original Printed on Recycled Paper

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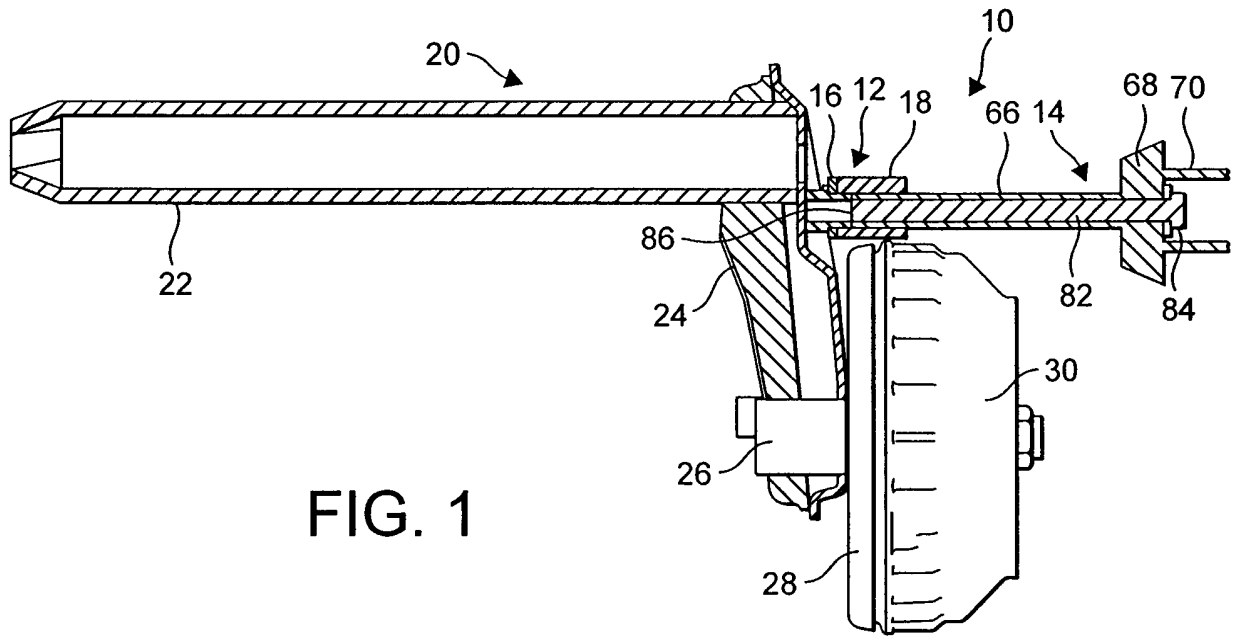


FIG. 1

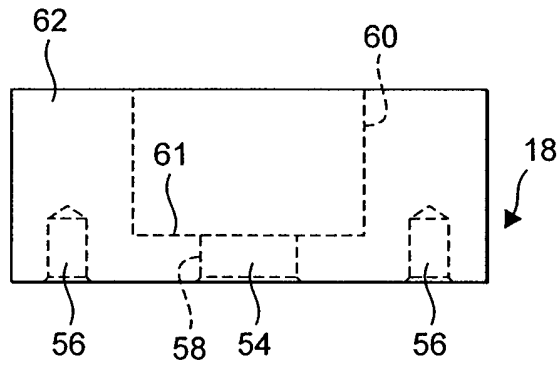


FIG. 2

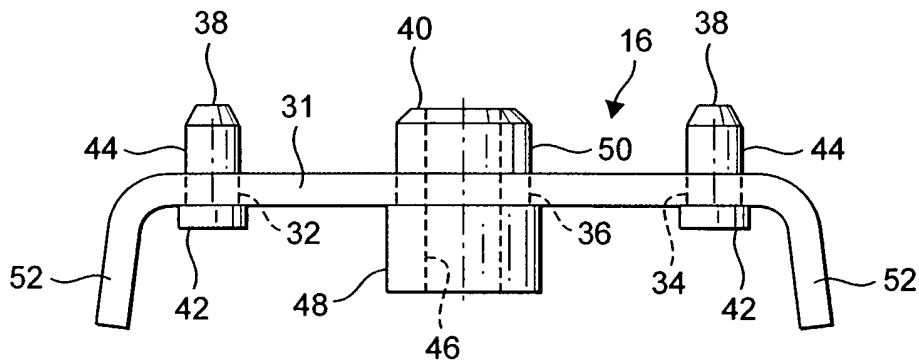


FIG. 3

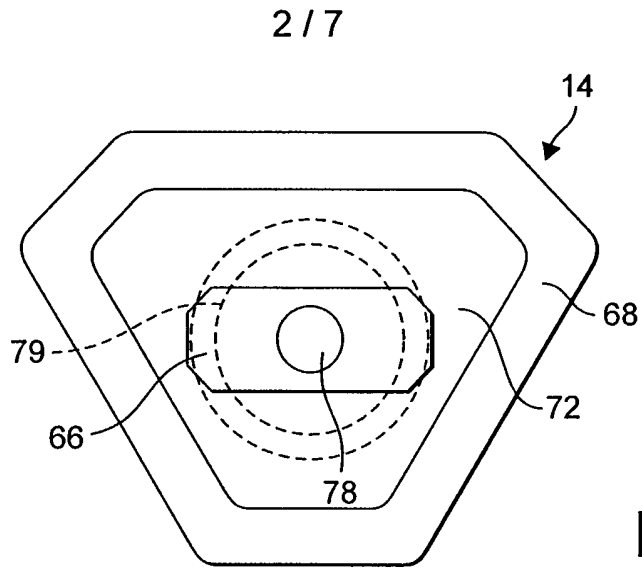


FIG. 4

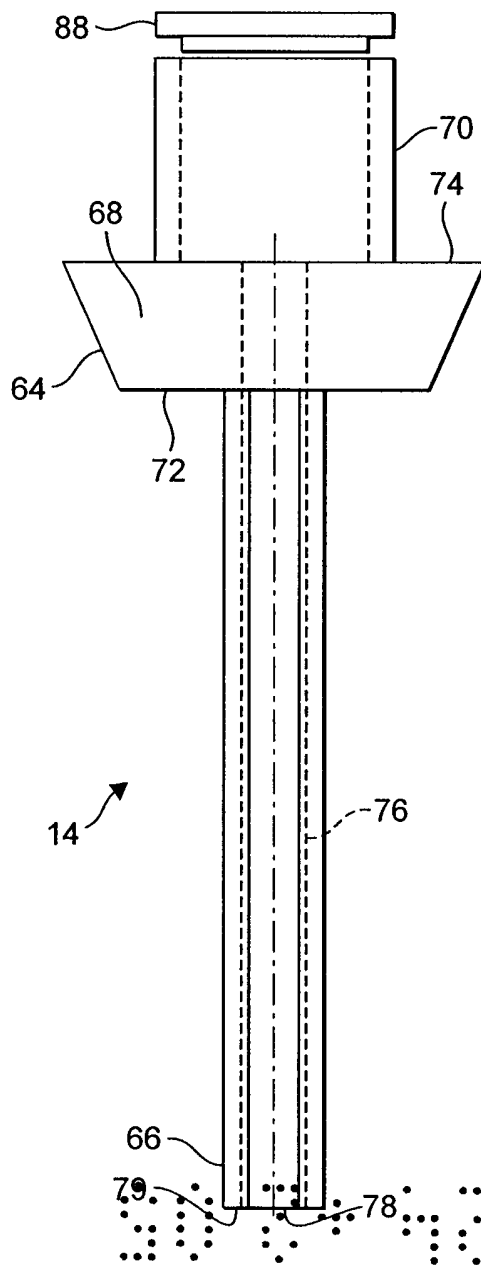


FIG. 5

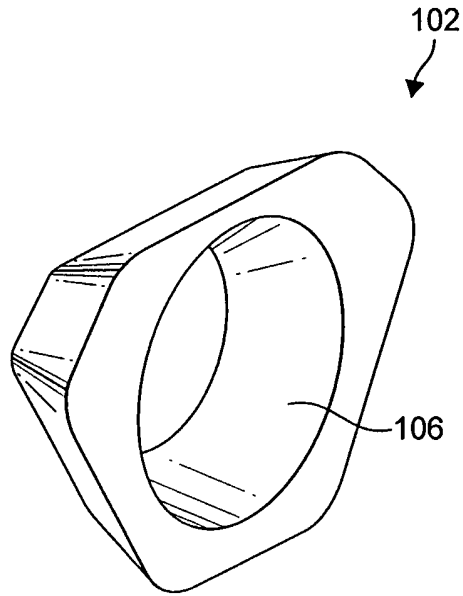


FIG. 6

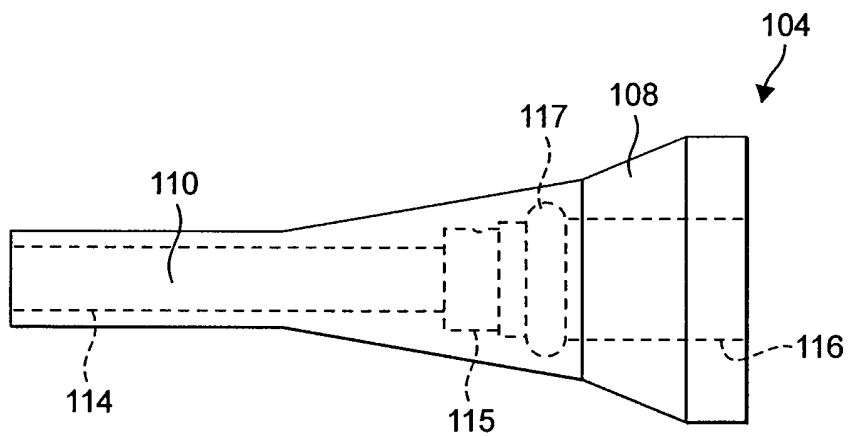
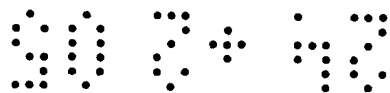


FIG. 7



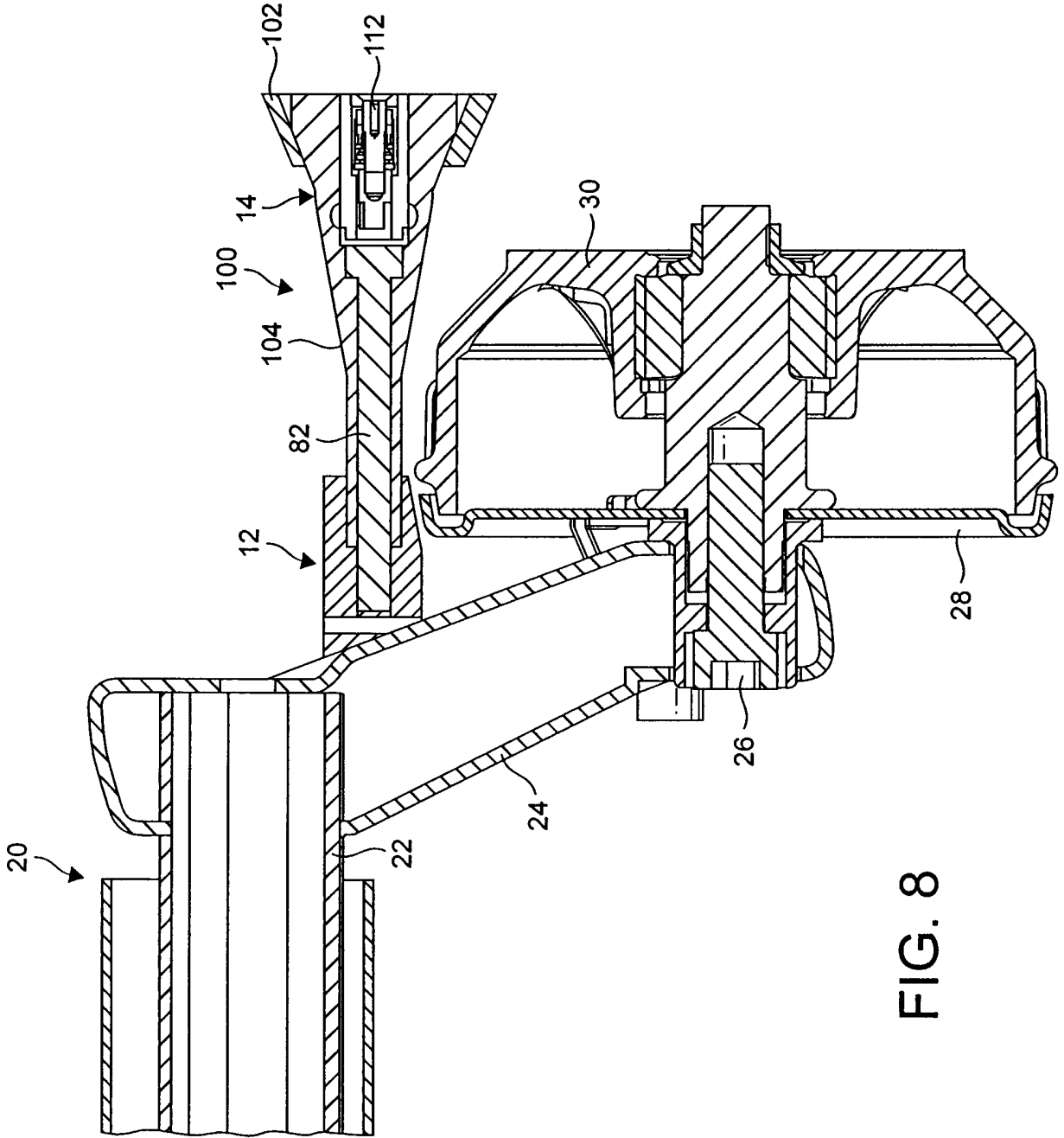
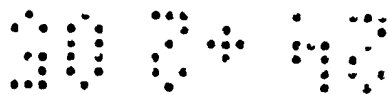


FIG. 8



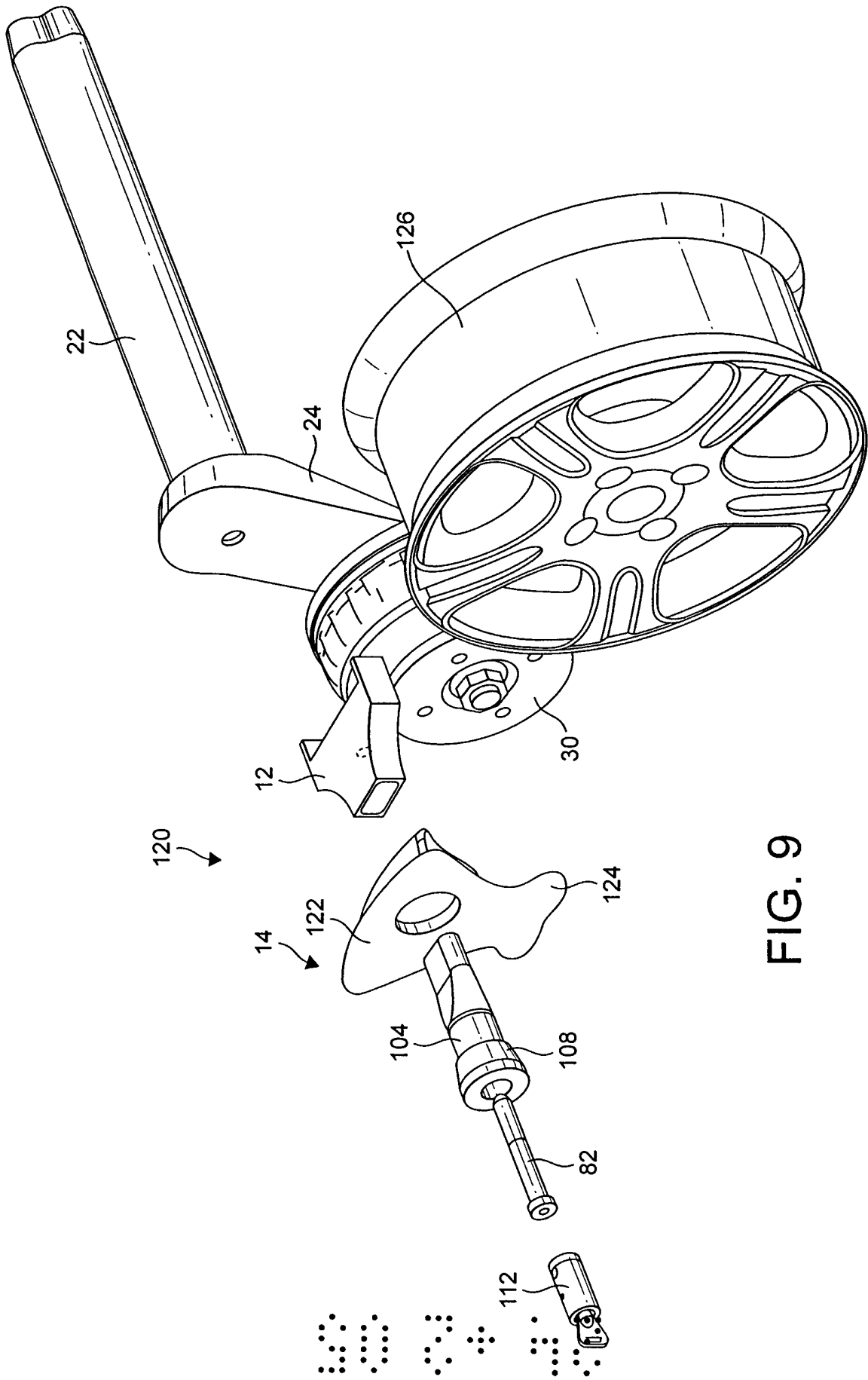


FIG. 9

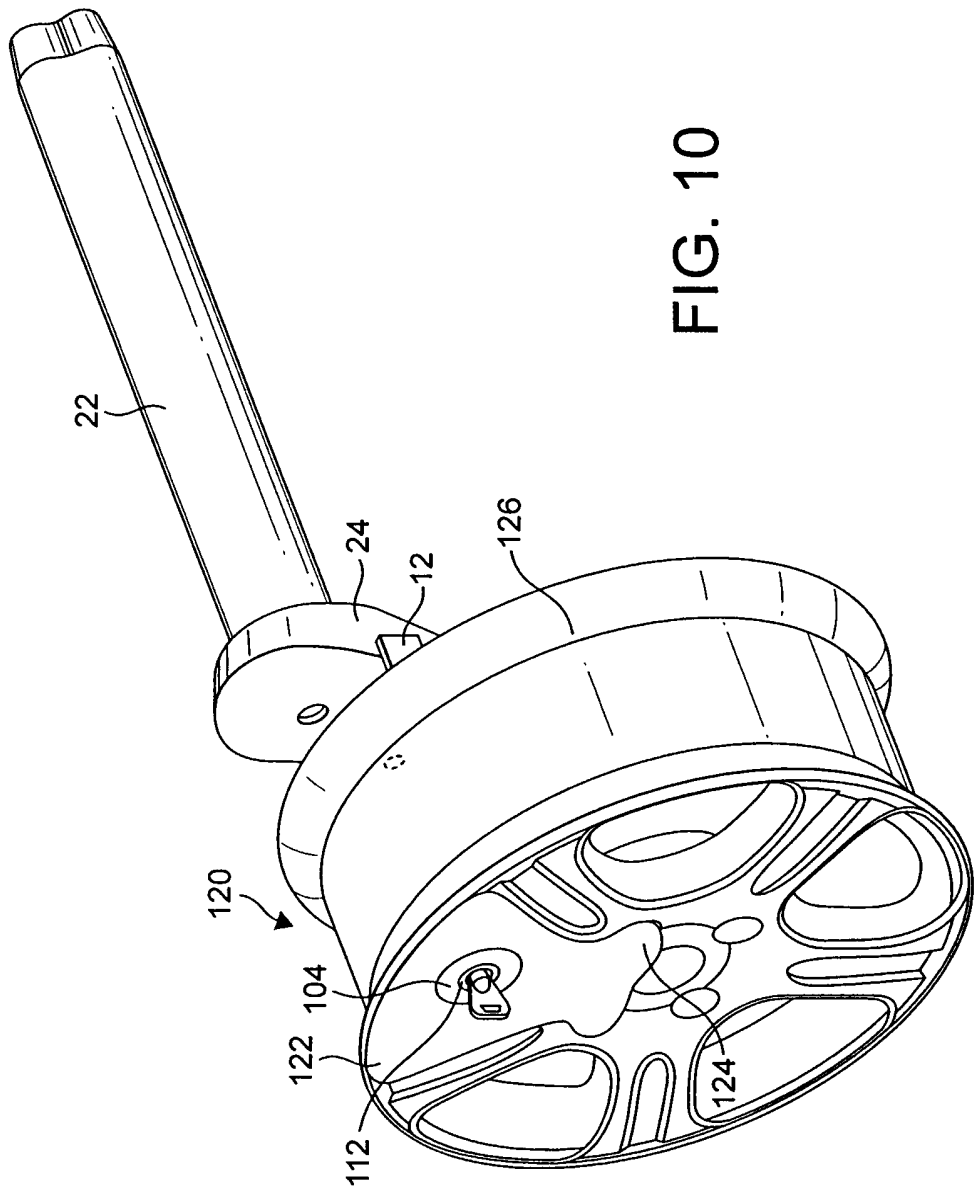
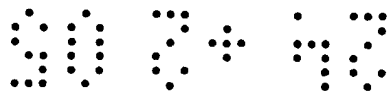


FIG. 10



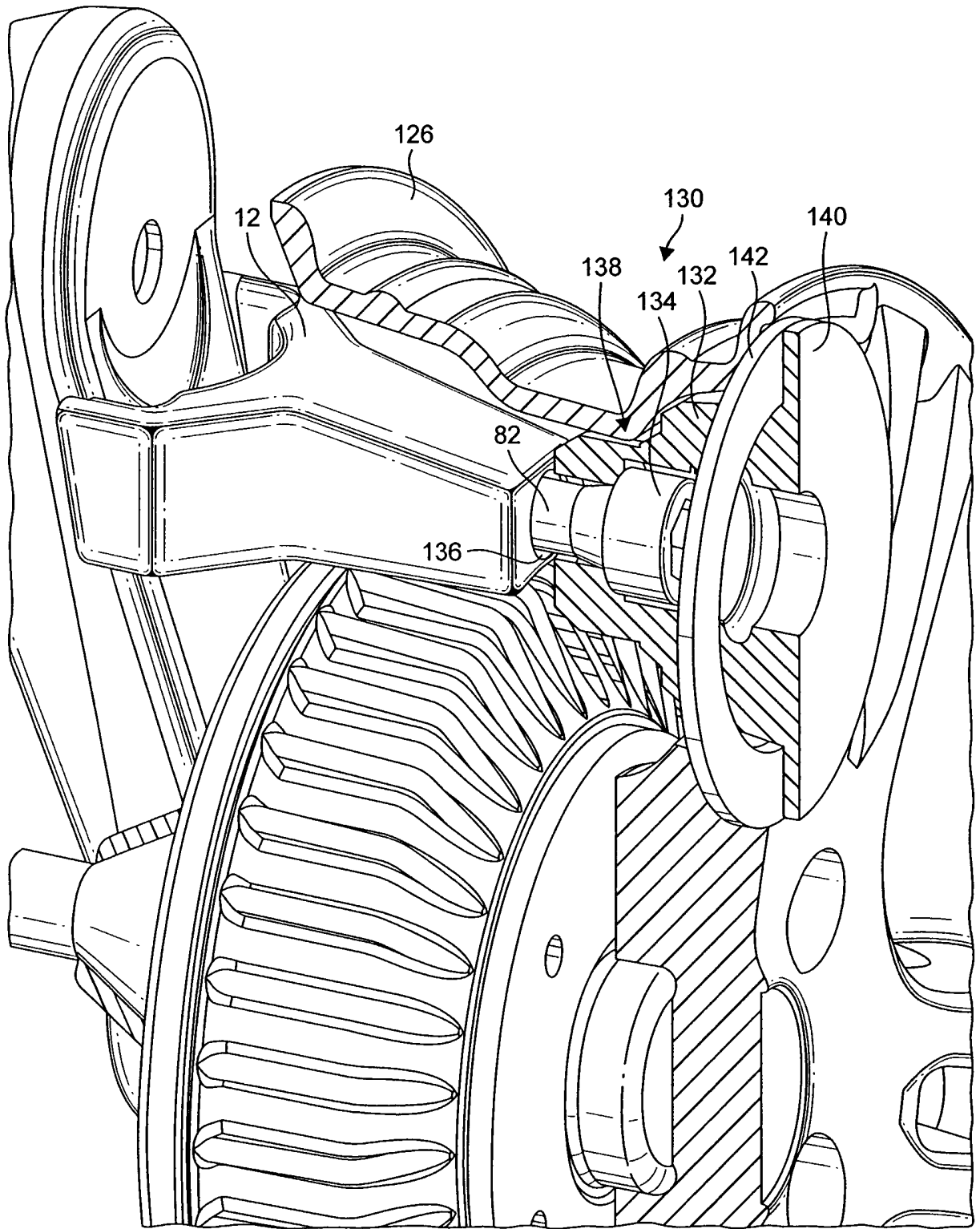


FIG. 11

Vehicle Security Apparatus

The present invention relates to a vehicle security apparatus and in particular to a security apparatus operable to prevent the unauthorised movement of a towable vehicles
5 and equipment.

The unauthorised removal of towable vehicles and equipment, such as trailers and caravans, is a growing problem. Wheel clamp devices which fit over and around one or more wheels of such vehicles have been utilised with limited success as they are easily
10 accessible and can often be removed by persons equipped with cutting tools. Known wheel clamp devices are also usually quite bulky which can lead to storage problems when not in use.

GB 2233616 discloses a security apparatus which is fittable between opposed wheels of
15 a towable vehicle such as a trailer. Installation of the device requires the accurate alignment of two elongate members under the towable vehicle such that apertures in each elongate member are aligned, followed by the installation of a padlock through the apertures. Accurate alignment of the members and installation of the padlock is hindered by the presence of the wheels and body of the towable vehicle, while the
20 padlock is left exposed and is hence vulnerable to tampering.

US 6,427,498 describes a security apparatus which includes a hooked member which, in use, is fitted through a wheel of a towable vehicle and around a portion of the vehicle chassis. The hooked member is secured by the use of a padlock which is attached to a
25 portion of the member which is external to the wheel. The fitting of the hooked member to the towable vehicle typically requires very careful positioning of the wheel with respect to the chassis, while the padlock is readily accessible and hence prone to tampering and attempted unauthorised removal.

30 US 4,622,833 discloses a security apparatus for a towable vehicle which comprises a tube secured to an axle of the vehicle and a pin extendable through a wheel of the

vehicle which is receivable in tube. The pin, in use extends through both the wheel and axle flange to which the wheel is mounted and hence the apparatus of US 4,622,833 is not suitable for towable vehicles having a braking arrangement, such as a drum brake, provided behind the wheel. Installation of the device requires the removal of one of the
5 bolts used to secure the wheel to the axle flange

According to a first aspect the present invention there is provided a towable vehicle security apparatus comprising a base securable to a suspension component of a towable vehicle chassis and a locking assembly releasably securable to said base, the locking
10 assembly, in use, being positionable through an aperture of a wheel of the towable vehicle to prevent the rotation of the wheel relative to the suspension component to which the base is secured.

The present invention provides a compact security apparatus which, in use prevents the
15 rotation of a wheel with which it is associated. The position of the base upon a movable suspension component of the towable vehicle chassis restricts access to the security apparatus as, in use, it is shielded by the vehicle wheel, suspension member and underside of the towable vehicle. The locking apparatus extends through a pre-existing aperture of the wheel, for example an aperture defined between adjacent
20 spokes and the rim of the wheel, and thereby negates the need for the wheel or the axle flange to which it is mounted to be modified to accommodate the security apparatus.

The base is provided with an attachment portion to permit the base to be secured to the vehicle chassis, and a seat portion adapted to receive a portion of the locking apparatus.
25 The attachment portion and seat portion may be defined by a common component. In an alternative embodiment the attachment portion and seat portion may comprise separate components which are associated with one another to define the base. The attachment portion is preferably provided with features which assist in the alignment and attachment of the attachment portion to the vehicle chassis. Said attachment
30 features may comprise one or more projections, one or more recesses, or a combination thereof. The attachment portion is provided with a locking feature accessible through the seat portion by the locking assembly.

The seat portion may be provided with a recess adapted to receive said portion of the locking assembly. Preferably the recess is sized and shaped to conform closely to that of said portion of the locking assembly to prevent excessive relative therebetween, in
5 use.

In the embodiment where the attachment and seat portions are defined by separate components, alignment means may be provided to assure the correct alignment therebetween. Said alignment means may comprise one or more projections receivable
10 in one or more complimentary recesses.

The locking assembly preferably includes an elongate locking member and a securing means to releasably secure the locking member to the base. The locking member includes an end which, in use, may be receivable in the seat portion of the base. In an
15 alternative embodiment the locking member may not be receivable in the base. In such an embodiment the securing means may extend from the locking member to the base.

The locking member preferably includes an interface portion adapted to fit closely to an aperture of a wheel of the towable vehicle. The interface portion may preferably fully conform to the shape of said aperture. The interface portion may preferably take the
20 form of a flange or boss of the locking member. The flange or boss may be provided with a protective coating. The interface portion may be formed integrally with the locking member. In an alternative embodiment the interface portion and locking member may comprise separate components which can be associated with one another. In such an embodiment the interface portion may be provided with an aperture
25 configured to receive the locking member therethrough. The aperture may be tapered and configured to receive a complementarily tapered portion of the locking member.

The interface portion may be configured so as to cover one or more of the wheel nuts or wheel bolts used to the attach the wheel to the towable vehicle. The interface may be
30 provided with an extension which, in use, overlies the one or more wheel nuts or wheel bolts.

The securing means may include an elongate member which, in use extends at least partially through the locking member. The elongate member may be provided within a longitudinal bore of the locking member. The elongate member may be provided at a first end with a formation co-operable with a complementary formation of the base.

5 The first end of the elongate member may be threaded. The opposite end of the elongate member is provided with a formation mateable with an appropriately configured tool to assist in the fitting and removal of the elongate member to the base.

The locking apparatus preferably also includes a plug fittable to the longitudinal bore of the locking member to shield the securing means and prevent access thereto. The plug is preferably releasably securable within the bore. The plug may be defined by a barrel lock.

10

According to a second aspect of the present invention there is provided a towable vehicle having a security apparatus according to the first aspect.

15

An embodiment of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a cross-sectional side view of a security device according to the present invention fitted to a vehicle suspension assembly;

20

Figure 2 shows a side view of a seat member of the present invention;

Figure 3 shows a side view of an attachment bracket of the present invention;

Figure 4 shows an end view of a locking member of the present invention;

Figure 5 shows a side view of the locking member of fig. 4;

Figure 6 shows a perspective view of a wheel profile collar according to an alternative embodiment of the present invention;

25

Figure 7 shows a side view of a locking member of an alternative embodiment of the present invention;

Figure 8 shows a cross-sectional side view of an alternative embodiment of the security device according to the present invention fitted to a vehicle suspension assembly;

30

Figure 9 shows an exploded perspective view of a further embodiment of a security device according to the present invention;

Figure 10 shows an assembled view of the security apparatus of figure 9; and

Figure 11 shows a partially sectioned view of a security apparatus according to a
5 further embodiment of the present invention

Referring firstly to figures 1 to 6 there is shown a security device, generally designated 10, comprising a base 12 and locking assembly 14. The base 12 comprises an attachment bracket 16 and a seat member 18. The device 10 is adapted to be fitted to a
10 towable vehicle suspension assembly 20 as shown in fig. 1. The assembly 20 is of the torsion type and comprises a tubular member 22, a trailing arm 24 and a stub axle 26. The tubular member 22 is adapted to be received together with a resilient torsion member (not shown) in a tubular axle (also not shown). The stub axle 26 carries a braking assembly of which the backing plate 28 and brake drum 30 are visible.

15

The attachment bracket 16 comprises a substantially "U" shaped member 31 formed from a strip of metal, for example steel. The member 31 is provided with opposing legs 52 to facilitate the attachment of the bracket 16 to the trailing arm 24, for example by welding. The member 31 is further provided with three spaced through apertures
20 32,34,36 which are sized to receive two location dowels 38 and a threaded ferule 40. The dowels 38 comprise a head portion 42 having a diameter greater than the respective dowel aperture 32,34, and a body portion 44 having a diameter able to fit through a dowel aperture 32, 34. The ferule 40 is cylindrical and has a threaded through aperture 46. In a similar manner to the dowels 38, the ferule 40 is provided with a head portion
25 48 having a diameter greater than the ferule aperture 36 and a body portion 50 having a diameter able to fit through the ferule aperture 36. The dowels 38 and ferule 40 are retained in association with the "U" shaped member 31 by any appropriate means such as, for example, welding or an interference fit between the components.

30 The seat member 18 comprises a metal body 62 having a through aperture 54 and a pair of blind apertures 56. The blind apertures 56 are spaced and sized to receive the portions of the dowels 38 which project from the bracket 16 and hence in combination

serve to locate the seat member 18 relative to the bracket 16. The through aperture 54 has a first portion 58 which is adapted to receive the projecting portion of the ferule 40 and a second portion 60 which is adapted to receive the locking assembly 14 and which will be described in greater detail below.

5

The locking assembly 14 includes a metal body 64 having an elongate fore portion 66, a boss 68, and a cylindrical shield 70. The fore portion 66 has a uniform octagonal cross-sectional shape over its length and is adapted to fit closely into the second portion 60 of the seat member through aperture 54. In use, the end face 79 of the fore portion 66 rests against the floor 61 of the second portion 60. The boss 68 is provided with opposing front and rear faces 72,74 from which the fore portion 66 and shield 70 extend respectively. As can be seen from the end view of fig. 4 the boss 68 has a substantially hexagonal shape comprising three longer and three shorter sides. The side view of fig. 5 shows the boss 68 to have a tapered profile between the faces 72,74.

15

The boss 68 is sized and shaped to conform to an aperture of a road wheel, for example an aperture defined and enclosed by adjacent spokes, and portions of the wheel rim and centre. It will be appreciated that other shapes and configurations of boss 68 may be utilised depending upon the size and shape of the apertures in a given wheel. The tapered nature of the boss 68 described above, and the appropriate length of the fore portion 66, enables the boss 68, in use, to lie flush with the outer surface of the wheel. The tapered surface of the boss 68 may be provided with a protective coating, for example a resiliently deformable plastics material, so as to reduce the possibility of damaging the wheel during application or removal of the locking assembly 14.

25

A through aperture 76 is provided between respective openings 78,80 in the distal end face 79 of the fore portion 66 and the rear face 74 of the boss 68. The aperture 76 is sized so as to be able to receive a bolt 82 therethrough which, in use, secures the locking assembly 14 to the base 12. The bolt 82 is of sufficient length that, in use, the bolt head 84 is fully surrounded by the cylindrical shield 70 while the opposite end 86 of the bolt 82 is received in the threaded aperture 46 of the ferule 40 as shown in fig. 1. Advantageously the bolt head 84 is of the security type which requires an appropriately

30

configured socket to apply torque thereto. The wall of the cylindrical shield 70 is of a sufficient height so as to prevent access to the bolt head 84 without a socket, and of a sufficient thickness to resist deformation should an attempt be made to apply a torque to the bolt head 84 by crushing the shield 70 by the use of grips or an oversize wrench.

5 Optionally the shield 70 may be provided with a plug 88 which, in use, prevents access to the bolt head 84. The plug is preferably provided with locking means (not shown) which prevent its unauthorised removal.

The device 10 may be fitted to a towable vehicle during the manufacture thereof or, 10 alternatively, may be retrofitted to an existing towable vehicle by means of a replacement axle set. The device 10 may be retrofitted where there is sufficient space for the base 12 to be fitted in a position where it is both accessible through a wheel aperture for the fitting and removal of the locking assembly 14, and does not impede the operation of the towable vehicle when not in use.

15

Operation of the device 10 is straightforward. In order to prevent the unauthorised towing of a towable vehicle, the vehicle is first moved to a position where it is intended to remain and an aperture of the wheel with which the device 10 is associated is aligned with the base 12. The metal body 64 of the locking assembly 14 is then introduced 20 through the wheel aperture and the fore portion 66 fitted to the seat member through aperture 54. The bolt 82 is then introduced through the body 64, mated with the thread of the ferule aperture 46 and tightened. Should an attempt be made to tow the vehicle without removing the locking assembly 14, then rotation of the wheel is prevented. Force applied to the towable vehicle is transmitted from the wheel to the boss 68 and in 25 turn through the fore portion 66 of the locking member to the base assembly 12 and the vehicle suspension. The towable vehicle may thus only be moved by overcoming the resistance applied by the non- turning wheel to ground. Should a towing vehicle succeed in dragging the towable vehicle, the tyre of the non-turning wheel will eventually burst and thereby prevent further movement. Removal of the locking 30 member 14 is achieved by undertaking the reverse of the procedure described above.

Referring now to Figs. 6, 7 and 8, there is shown an alternative embodiment of a security device, generally designated 100, according to an alternative embodiment of the present invention. Features and components common to the embodiment of Figs. 1 to 5 are identified with like reference numerals. The alternative embodiment differs in that the metal body of locking assembly 14 is of a two piece construction comprising a separate boss or wheel interface portion 102 which is fittable to a locking member 104. Both the boss and locking member are manufactured from metal. The boss 102 is provided with a tapered through aperture 106 which, in use, receives a correspondingly tapered portion 108 of the locking member 104.

10

The locking member 104 is further provided with a through aperture 110 into which are received, in use, the bolt 82 and a lock barrel 112. The through aperture 110 comprises a fore portion 114 having a first diameter, an intermediate portion 115 having a second diameter, and an end portion 116 having a third diameter portion. The fore portion 114 is sized so as to receive the threaded portion of the bolt 82 therethrough, while the intermediate portion 115 is sized to receive the head of the bolt 82. The end portion 116 is sized to receive a lock barrel 112 and includes a recess 117 positioned so as to receive a locking feature of the barrel lock 112. As can be seen from figure 8 the bolt 82, in use, is fully received within the locking member 104 and is shielded by the lock barrel 112. The lock barrel 112, when fitted, prevents access to the head of the bolt 82

20

The provision of a separate boss and locking member 102, 104 is advantageous in that an interchangeable selection of bosses 102 may be provided to take into account different configurations of wheel fitted to a towable vehicle. By fully recessing the bolt 82 within the locking member 104 the possibility of a person gaining unauthorised access to the bolt head in an attempt to remove the device 100 is reduced further.

25

Referring to figures 9 and 10 there is shown a further embodiment of a security apparatus, generally designated 120, according to a further embodiment of the present invention. Features common to the earlier described embodiments are identified with like reference numerals. The apparatus 120 is similar to that described with reference to figures 7 and 8 in that the metal body of the locking assembly 14 is of a two piece

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construction comprising a locking member 104 and a separate boss 122. The boss 122 includes an extension 124 which, in use, overlies and prevents access to two adjacent wheel nuts of a wheel 126 to which the apparatus 120 is fitted.

5 Referring finally to figure 11 there is shown a further embodiment of a security apparatus, generally designated 130, according to a further embodiment of the present invention. Features common to the earlier described embodiments are identified with like reference numerals. The apparatus 130 comprises a base 12 fitted to the trailing arm 24 of a towable vehicle suspension and a locking assembly 14 fittable to the base
10 12. The locking assembly 14 comprises a metal body 132 fittable into an aperture of a wheel 126 and a bolt 82.

It will be appreciated that the base 12 of the embodiment of figure 11 is longer than the bases 12 of the previously described embodiments. The base 12 of the embodiment of
15 figure 11 thus projects from the trailing arm 24 beyond the inner rim of the wheel 126 and into the annular space defined between the wheel 126 and the brake drum 30. Consequently both the metal body 132 and bolt 82 are shorter than those described with reference to the earlier described embodiments. The bolt 82 extends through a
20 bore 134 of the body 132 and into a threaded hole 136 of the base 12. The bolt 82 may be loosely retained in the bore 134, for example by a circlip, to prevent the bolt 82 and body 132 becoming separated when not fitted to the base 12. The body 132 includes a tapered fore portion 138 which, in use extends through the aperture of the wheel 126 and a flange 140 having dimensions greater than those of the wheel aperture so as to prevent the body 132 from being able to pass fully through the wheel aperture. The
25 flange 140 is provided with an annular gasket 142 of a resiliently compressible material which, in use, is interposed between the flange 140 and the wheel 126.

The apparatus 130 may be installed in a manner similar to that described above for the embodiments of figures 1 to 10. An aperture of a wheel 126 of a towable vehicle is
30 aligned with the base 12 such that the base 12 is visible and accessible therethrough. The body 132 is then fitted to the wheel aperture and the bolt 82 engaged in the threaded hole 136 of the base 12. It will be appreciated that the apparatus 130 shown in

figure 11 differs from the embodiments of figures 1 to 10 in that only the bolt 82 is received by the base 12 and not the body 132 and bolt 82. In use, the end face of the body 132 rests against the corresponding end face of the base 12 and is clamped securely thereto by the bolt. The provision of the compressible gasket 142 ensures that
5 the metal body 132 is able to fit closely to the wheel 126 without scratching or damaging the exterior thereof. The lengths of the base 12 and body 132 may be such that a degree of compression of the gasket 142 is required to enable the respective end faces of the base 12 and body 132 to meet. Once the bolt 82 has been secured to the base 12 a plug in the form of a barrel lock (not shown) may be inserted into the open
10 end of the bore 134 to prevent access to the bolt 82.

The present invention provides a simple and effective means of preventing the unauthorised movement of a towable vehicle. The device is less complicated and smaller than existing external wheel lock or clamp systems. The positioning of the
15 interface between the base assembly and the locking member between the rear face of a wheel and the vehicle chassis substantially restricts access thereto and hence prevents tampering.

Claims

1. A towable vehicle security apparatus comprising a base securable to a suspension component of a towable vehicle chassis and a locking assembly releasably securable to said base, the locking assembly, in use, being positionable through an aperture of a wheel of the towable vehicle to prevent the rotation of the wheel relative to the suspension component to which the base is secured.
5
2. A security apparatus as claimed in claim 1 wherein the base is provided with an attachment portion to permit the base to be secured to the suspension component and a seat portion adapted to receive a portion of the locking apparatus.
10
3. A security apparatus as claimed in claim 2 wherein the seat portion includes a recess within which a portion of the locking assembly is receivable.
15
4. A security apparatus as claimed in claim 2 or claim 3 wherein the base is provided with a locking feature accessible through the seat portion by the locking assembly.
- 20 5. A security apparatus as claimed in any preceding claim wherein the locking assembly includes a compressible portion which abuts a wheel of the towable vehicle, in use.
6. A security apparatus as claimed in any preceding claim wherein the locking assembly includes an elongate locking member and a securing means to releasably secure the locking member to the base.
25
7. A security apparatus as claimed in claim 6 wherein the locking member includes an interface portion shaped to fit closely to an aperture of a wheel of the towable vehicle.
30

8. A security apparatus as claimed in claim 7 wherein the interface portion comprises a flange of the locking member.
9. A security apparatus as claimed in claim 7 or claim 8 wherein the interface portion and locking member comprise separate components which are fittable to one another.
10. A security apparatus as claimed in claim 9 wherein the interface portion is provided with an aperture configured to receive the locking member therethrough.
11. A security apparatus as claimed in claim 10 wherein the aperture of the interface portion is tapered and configured to receive a complementarily tapered portion of the locking member.
12. A security apparatus as claimed in any of claims 7 to 11 wherein a portion of the locking apparatus is configured so as to cover one or more of the wheel nuts or wheel bolts used to attach the wheel to the towable vehicle.
13. A security apparatus as claimed in claim 12 wherein the interface portion of the locking apparatus is provided with an extension which, in use, overlies the one or more wheel nuts or wheel bolts.
14. A security apparatus as claimed in any of claims 6 to 13 wherein the securing means comprises an elongate member which, in use, extends through a longitudinal bore of the locking member.
15. A security apparatus as claimed in claim 14 wherein the elongate member is provided at a first end with a formation co-operable with a complementary formation of the base.
16. A security apparatus as claimed in claim 15 wherein said first end of the elongate member is threaded.

17. A security apparatus as claimed in any of claims 14 to 16 wherein the locking assembly includes a plug fittable to the longitudinal bore of the locking member to shield the securing means and prevent access thereto.

5

18. A towable vehicle having a chassis and at least one wheel, the vehicle further including a security apparatus comprising a base secured to a suspension component of the chassis and a locking assembly releasably securable to said base, the locking assembly, in use, extending through an aperture of said at least one wheel to prevent the rotation thereof relative to the suspension component.

10

19. A towable vehicle as claimed in claim 18 wherein the base is secured to a suspension arm of the chassis.

15

20. A towable vehicle as claimed in claim 18 or claim 19 wherein the base comprises an attachment portion secured to the suspension component and a seat portion adapted to receive a portion of the locking apparatus.

20

21. A towable vehicle as claimed in claim 20 wherein the seat portion includes a recess within which a portion of the locking assembly is receivable.

25

22. A towable vehicle as claimed in claim 20 or claim 21 wherein the base is provided with a locking feature accessible through the seat portion by the locking assembly.

23. A towable vehicle as claimed in any of claims 18 to 22 wherein the locking assembly includes a compressible portion which abuts a wheel of the towable vehicle, in use.

30

24. A towable vehicle as claimed in any of claims 18 to 23 wherein the locking assembly includes an elongate locking member and a securing means to releasably secure the locking member to the base.

25. A towable vehicle as claimed in claim 24 wherein the locking member includes an interface portion shaped to fit closely to an aperture of a wheel of the towable vehicle.
- 5
26. A towable vehicle as claimed in claim 25 wherein the interface portion comprises a flange of the locking member.
27. A towable vehicle as claimed in claim 25 or claim 26 wherein the interface portion and locking member comprise separate components which are fittable to one another.
- 10
28. A towable vehicle as claimed in claim 27 wherein the interface portion is provided with an aperture configured to receive the locking member therethrough.
- 15
29. A towable vehicle as claimed in claim 28 wherein the aperture of the interface portion is tapered and configured to receive a complementarily tapered portion of the locking member.
- 20
30. A towable vehicle as claimed in any of claims 25 to 29 wherein a portion of the locking apparatus is configured so as to cover one or more of the wheel nuts or wheel bolts used to the attach the wheel to the towable vehicle.
- 25
31. A towable vehicle as claimed in claim 30 wherein the interface portion of the locking apparatus is provided with an extension which, in use, overlies the one or more wheel nuts or wheel bolts.
- 30
32. A towable vehicle as claimed in any of claims 24 to 31 wherein the securing means comprises an elongate member which, in use, extends through a longitudinal bore of the locking member.

33. A towable vehicle as claimed in claim 32 wherein the elongate member is provided at a first end with a formation co-operable with a complementary formation of the base.

5 34. A towable vehicle as claimed in claim 33 wherein said first end of the elongate member is threaded.

35. A towable vehicle as claimed in any of claims 32 to 34 wherein the locking assembly includes a plug fittable to the longitudinal bore of the locking member to
10 shield the securing means and prevent access thereto.



INVESTOR IN PEOPLE

Application No: GB0427489.0

Examiner: Mr Colin Thompson

Claims searched: 1-35

Date of search: 4 April 2005

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	1-4,6-8,18, 20-22,24-26	US4622833 A (Shepherd) See whole document
X	1-3,6,14, 18-21,24,32	NL 8403751 A (Warnau) See whole document
X	1-4,6,18,20-22,24	US 6360571 B1 (O'Neal) See Fig 4
X	1-3,18-20	GB 2276597 A (Miles) See whole document

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 :

B7J

Worldwide search of patent documents classified in the following areas of the IPC⁰⁷

B60R

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

WPI, EPODOC