surface and the foot part of the bollard assembly may require providing the local ground surface (e.g. the base of an excavation) with a suitably inclined surface. This is difficult to achieve with accuracy and is labour intensive.

The invention aims to provide means and methods which may be used to help address these and other problems and desirably to provide a suitable bollard assembly at reduced cost and labour.

In a first of its aspects, the invention may provide a bollard apparatus for use as a fixed vehicle barrier including:

a bollard member having a base end; and,

a foundation assembly adapted for fixed ground engagement;

wherein the foundation assembly ~~defines~~comprises a housing part dimensioned and arranged for retaining the base end of the bollard member together with cementing material for cementing the bollard member to the foundation assembly within the housing part such that the inclination of the bollard member relative to the foundation assembly is adjustable while the cementing material is not set (e.g. cured or hardened or rigid) and is fixed upon the cementing material becoming set thereby to cement the inclination of the bollard member relative to the foundation assembly~~.~~;

wherein the foundation assembly includes an aperture arranged in register with the housing part and dimensioned to admit therethrough parts of the bollard member so as to extend from within the housing part between the base end of the bollard member and a top end of the bollard member in a direction transverse to the foundation assembly, and a transverse dimension of the base end of the bollard member exceeds a corresponding transverse dimension of the aperture such that the base end of the bollard is thereby prevented from passing through the aperture from within the housing part.

In this way, the inclination of the upstanding bollard relative to a local ground surface, in use, may be set as desired by the use of a controlled quantity of locally housed cementing material. By controlling the location and quantity of the cementing material, the housing part of the assembly enables minimal additional depth to the

foundation assembly thereby enabling it to remain shallow and suitable for use in a shallow-mount bollard apparatus or assembly. The use of cementing material as an interface/coupling between the base end of the bollard member and the foundation assembly means that the whole immersed surface area of the bollard member is available for efficiently transferring impact forces from the bollard member (when subject to transverse impact) through the intervening cementing material and in to the foundation assembly – and thence into the ground. The area of interface may be adjusted simply by suitably adjusting the internal dimensions of the housing part and

the quantity of cementing material it retains in use. The cementing material may act in the manner – at least to some extent – of a shock absorber.

~~The housing is preferably dimensioned and arranged for retaining the base end of the bollard member within the housing thereby to prevent the bollard member from being separated from the foundation assembly e.g. by virtue of the dimensioning of the housing. For example, the housing may be dimensioned to obstruct such separation. The base end of the bollard member may possess dimensions exceeding those of an opening in the foundation assembly through which the bollard member extends from its base end within the housing, thereby preventing passage of the base end through the opening and out of the housing.~~

It is to be understood that while the bollard apparatus is preferably a shallow-mount bollard assembly, ~~the bollard apparatus~~it may be other than a shallow-mount.

~~The~~ Accordingly, the foundation assembly may be adapted to be assembled with the bollard member(s) to ~~provide a significant~~significantly laterally ~~extending foundation~~extend as a base or foot part, when fixed at the base of the upstanding bollard body, for engaging and extending across the ground~~, e.g. at the base of an excavation. The excavation may be subsequently filled in to bury the foot part (e.g. with earth, concrete or cement).~~.

The foundation assembly ~~may include~~includes an aperture arranged in register with the housing part and dimensioned to admit therethrough parts of the bollard member so as to extend from within the housing part between the base end of the bollard member and a top end of the bollard member in a direction transverse to the foundation assembly. The positioning and orientation of the aperture relative to the direction or axis of lateral extension of the foundation assembly defining the foot, may impose the transverse orientation of the bollard member when assembled therewith. The plane of the aperture may be parallel to the lateral extension of the foundation assembly. The foundation assembly may comprise a plate member which may be shaped to extend to define the foot and the plane of the aperture may be parallel to the plane in which the plate so extends. The aperture is preferably a circular aperture and the bollard member is preferably circular in cross section at its outermost surface of the parts thereof arranged to extend through the assembled bollard. Circularity has

the benefit of having symmetry enabling adjustability of inclination in any tilt direction of the bollard member.

internal dimension of the housing part (sump) exceeds a corresponding transverse dimension of the aperture such that parts of the foundation assembly defining the aperture appose (i.e. separated and opposing) internal surfaces of the housing part (sump) therewith to define a chamber for receiving the cementing material. That is to say, parts of the foundation assembly defining the aperture may preferably also define the ceiling of the chamber of the housing part. This overhanging/ceiling structure has important consequences for securing the bollard base end and the cementing material (once set/cured) when retained in the chamber of the housing part. It also provides a resistive surface for receiving forces transferred through the cementing material from the bollard member (when impacted), so that those forces may be dispersed along the rest of the foundation assembly efficiently. It prevents the cementing material being lifted out of the chamber of the housing part by the torque forces generated on the bollard member when subjected to transverse impact force.

A transverse dimension of the bollard member at or adjacent the base end of the bollard member ~~may exceed~~exceeds a corresponding transverse dimension of the aperture such that the base end of the bollard is thereby prevented from passing through the aperture from within the housing part. This prevents the bollard member from being uprooted from the foundation assembly. The foundation assembly may include a plate member having a through-opening containing a fixed collar member upstanding from plate member at the periphery of the through-opening thereby defining the aperture of the foundation assembly at the outermost end of the collar (e.g. the collar end uppermost in use). The plate member may be a one-piece plate, such as a metal plate (e.g. steel) which may between 30mm and 100mm thick, or more preferably between 30mm and 60mm thick, or yet more preferably between 30mm and 50 mm (e.g. about 40mm) thick.

Preferably, the housing part extends/projects transversely from the surface of the plate member by no more than about 150mm, and preferably by no more than about between 75mm and 125mm. This retains a shallow maximal depth to the foundation assembly.

The plate member is preferably shaped to define a plurality of tongue portions each separated from a neighbouring tongue portion by an intermediate bridging portion extending transversely therebetween. The plate member may have formed within it a plurality of through-openings each containing a respective said collar member in the

manner described above. Each collar member is preferably fixed to the plate member at a respective position thereupon in register with a respective one of the tongue portions such that the tongue portion projects in a direction transverse to the length of the bollard member when received within the collar member.

The bollard member may include an anchor part adjacent the base end thereof and outwardly projecting therefrom in a direction transverse to the longitudinal axis thereof. The housing part is preferably dimensioned to receive the base end, the anchor part and sufficient cementing material to immerse the anchor part therein. The anchor part may be a plate (e.g. circular) with a central through-opening through which the axial/longitudinal body of the bollard member passes at its base end. The anchor part may be a circular ring plate fixed (e.g. welded) to the bollard member adjacent its base.

The bollard apparatus may include the cementing material in the form of a grout material, either in powdered form, in liquid form or in solid form e.g. (set/cured within the housing part).

The cementing material preferably has a compressive strength of between 50 N/mm^2 and 100 N/mm^2, more preferably between 60 N/mm^2 and 80 N/mm^2 (Newtons per millimetre squared). The cementing material preferably has a flexural strength of between 5 N/mm^2 and 15 N/mm^2, more preferably between 8 N/mm^2 and 11 N/mm^2 (Newtons per millimetre squared). The cementing material preferably has a static modulus of elasticity of between 15 N/mm^2 and 30 N/mm^2, preferably between 20 N/mm^2 and 25 N/mm^2 (Newtons per millimetre squared) The cementing material is most preferably a non-shrinkage material which substantially does not shrink in volume upon setting/hardening. A suitable cementing material is the commercially available product known as "Ultracrete ® HF – High Flow Precision Grout" (formerly known as "Cemflow ® HF") provided by the Instarmac ® Group plc.

In a second of its aspects, the invention may provide a bollard comprising the bollard apparatus described above in assembled form in which said base end of the bollard member is housed together with said cementing material in said housing part thereby cementing the bollard member to the foundation assembly within the housing part such that the inclination of the bollard member relative to the foundation assembly is fixed by the cementing material at a desired inclination

In a third of its aspects, the invention may provide a fixed vehicle barrier including one or more bollards according to the invention in its second aspect with bollard member(s) upstanding from a local ground level in which the one or more foundation assembly is buried thereby to fix it to the local ground level.

In a fourth aspect, the invention may provide a method of erecting a bollard for use as a fixed vehicle barrier including:

providing a bollard assembly including:

bollard member having a base end; and,

a foundation assembly adapted for fixed ground engagement ~~defining~~comprising a housing part dimensioned and arranged for housing ~~(e.g. retaining)~~ the base end of the bollard member together with cementing material;

enclosing the base end within the housing part ~~(e.g. thereby to retain the base end within the housing part);~~;

engaging the foundation assembly with a ground surface with the bollard member upstanding;

placing cementing material within the housing part;

adjusting the inclination of the bollard member relative to the foundation assembly to a desired inclination while the cementing material is not set;

allowing the cementing material to set thereby to cement the inclination of the bollard member relative to the foundation assembly.

~~In a fifth of its aspects, the invention may provide a shallow mountable bollard assembly comprising: a foundation assembly comprising a plate member arranged for ground engagement and shaped to define a plurality of tongue portions each separated from a neighbouring tongue portion by an intermediate bridging portion extending transversely therebetween; and, a plurality of bollard members each fixed~~

~~to the plate member at a respective position thereupon in register with a respective one of the tongue portions such that the tongue portion projects in a direction transverse to the length of the bollard member.~~

~~Each of the tongue portions is preferably located at a common side of the plate member. The bollard assembly may comprise no more than two tongue portions, or no more than four tongue portions. The shallow mountable bollard assembly may comprise the bollard apparatus described in the first aspect of the invention or the bollard of the second aspect of the invention, involving cementing material. Alternatively, the bollard members may be fixed to the plate member by welding. This may be by directly welding the bollard member to the plate member or by welding the bollard member within an intermediate collar member (such as described herein) which is itself welded to the plate member.~~

~~In a sixth of its aspects, the invention may provide a method of manufacturing a shallow mountable bollard apparatus comprising: providing a rectangular plate; cutting the rectangular plate in to two plate halves each reciprocally shaped to define a plurality of tongue portions each separated from a neighbouring tongue portion by an intermediate bridging portion extending transversely therebetween; and, removing from at least one of the two plate halves parts excess plate parts which are neither a tongue portion or a bridging portion thereby to define a plate member for ground engagement; and, fixing each of a plurality of bollard members to one of the plate members at a respective position thereupon in register with a respective one of the tongue portions such that the tongue portion projects in a direction transverse to the length of the bollard member.~~

~~The rectangular plate may be cut in to two halves each reciprocally shaped to define four tongue portions.~~

The invention in any aspect preferably employs bollard a metal bollard member(s), and a metal foundation assembly. The metal is preferably steel.

A foundation assembly according the invention in any of its aspects described above may comprises a plate member arranged for ground engagement and at least one rib member attached thereto along a surface thereof to strengthen the foundation member against bending transversely to the rib. The foundation assembly may be shaped to define a plurality of tongue portions each separated from a neighbouring

Figure 12 shows an underside view of a bollard assembly of figures 10 and 11;

Figure 13 shows a perspective view of the bollard assembly of figures 10 to 12;

Figure 14 shows a perspective view of the bollard assembly;

Figure 15 shows an underside view of a bollard assembly of figure 14;

Figure 16 shows a front view of a bollard assembly of Figures 14 and 15. In the drawings like articles are assigned like reference symbols.

Figure 1 illustrates a shallow-mount bollard assembly including a foundation assembly (2, 4A, 4B) shaped from a steel plate to define two tongue portions (4A, 4B) each separated from the other by an intermediate bridging portion (2) extending transversely there-between. The two separated tongue portions extend in parallel at a common side of the plate to define a flat and generally U-shaped footplate for ground engagement.

The thickness of the plate is approximately 400mm (or thereabouts) thereby defining a very shallow foundation assembly for mounting the bollard assembly upon a ground surface at the base of a correspondingly shallow excavation within which the bollard assembly may be fixed by a shallow covering of concrete or other suitable burying material.

The bollard assembly comprises two separate bollard members (3, 4) each fixed to the foundation assembly at a respective position thereupon in register with a respective one of the two tongue portions (4A, 4B) such that a tongue portion projects from the base of an associated bollard member in a direction generally transverse to the length of that bollard member.

The two bollard members are also in register with the bridging portion (2) of the plate forming the foundation assembly with the result that the tongue portions (4A, 4B) of the foundation assembly both individually and collectively define a means for transferring to the ground upon which the bollard is engaged any transverse impact forces applied to a bollard member which urge the bollard member in the direction of

portion. A housing part (15, 24 and 16, 23) is provided on a face of the plate of the foundation assembly reverse to that from which a collar member (5, 6) is upstanding and aligned in register with the through-opening of the plate and the aperture defined by a respective collar member. As a result a given through-opening in the plate of the foundation assembly is sandwiched between the upstanding parts of an associated collar member and the underlying housing part. ~~The housing part and the parts of the face of the plate of the foundation assembly covered by the housing part, collectively define a housing for retaining the base end of a bollard member.~~

A housing part is provided separately for each of the two bollard members (3, 4), and is dimensioned and arranged for retaining a base end (25, 26) of the respective bollard member together with cementing material (not shown) for cementing the bollard member to the foundation assembly within the housing part.

Each housing part comprises a sump or chamber for enclosing and retaining an associated bollard base end and cementing material with which to encapsulate the retained bollard base end. Each housing part comprises an enclosure wall member (23, 24) surrounding the through-opening of the plate of the foundation assembly, and is upstanding from the underside of the plate. The housing part further includes a cover plate (15, 16) shaped and dimensioned to interface with the full periphery of the enclosure wall member with which it is associated therewith to define the chamber or sump as an enclosed volume.

An enclosure wall member may be square in shape comprising four straight walls joined at vertices defining a square surrounding the through-opening (11, 12) of the plate of the foundation assembly. The cover plate (15, 16) may be a correspondingly dimensioned square plate arranged to be fixed to the enclosure wall member by screws (17, 18) or bolts (with nuts 7A, 18A) or the like passing through the plate member into parts of the enclosure wall member, or by other suitable fixing means such as would be readily apparent to the skilled person

In the example illustrated in Figures 2 to 5 each cover plate comprises two parallel rows of bolt holes passing there through along two opposite parallel edges of the cover plate in which bolts (17, 18) of the housing part are arranged to pass and into the enclosure wall member to secure the cover plate member thereto. However, the remaining two parallel edges of the square cover plate (15, 16) each possess an

CLAIMS:

1. A bollard apparatus for use as a fixed vehicle barrier including:

a bollard member having a base end; and,

a foundation assembly adapted for fixed ground engagement;

wherein the foundation assembly defines a housing part dimensioned and arranged for retaining the base end of the bollard member together with cementing material for cementing the bollard member to the foundation assembly within the housing part such that the inclination of the bollard member relative to the foundation assembly is adjustable while the cementing material is not set and is fixed upon the cementing material becoming set thereby to cement the inclination of the bollard member relative to the foundation assembly.

2. A bollard apparatus according to any preceding claim in which the foundation assembly includes an aperture arranged in register with the housing part and dimensioned to admit therethrough parts of the bollard member so as to extend from within the housing part between the base end of the bollard member and a top end of the bollard member in a direction transverse to the foundation assembly.

3. A bollard apparatus according to claim 2 in which a transverse dimension of the aperture exceeds a corresponding transverse dimension of those parts of the bollard member which the aperture is arranged to admit by an amount sufficient to define a gap therebetween within which the bollard member is moveable to adjust its inclination relative to the foundation member.

4. A bollard apparatus according to any of claims 2 to 3 in which a transverse dimension of the aperture exceeds a corresponding transverse dimension of those parts of the bollard member which the aperture is arranged to admit by an amount sufficient to define a gap therebetween through which said cementing material is flowable to fill regions within housing part which surround the base end of the bollard member.

5. A bollard apparatus according to any of claims 2 to 4 in which a transverse dimension of the base end of the bollard member exceeds a corresponding transverse dimension of the aperture such that the base end of the bollard is thereby prevented from passing through the aperture from within the housing part.

6. A bollard apparatus according to any of claims 2 to 5 in which the housing part defines a sump a transverse dimension of which exceeds a corresponding transverse dimension of the aperture such that parts of the foundation assembly defining the aperture appose internal surfaces of the sump therewith to define a chamber for receiving said cementing material.

7. A bollard apparatus according to any of claims 2 to 6 in which the foundation assembly includes a plate member having a through-opening containing a fixed collar member upstanding from plate member at the periphery of the through-opening thereby defining said aperture at the outermost end of the collar.

8. A bollard apparatus according to any preceding claim in which the bollard member includes an anchor part fixed adjacent the base end thereof and outwardly projecting therefrom in a direction transverse to the longitudinal axis thereof wherein the housing part is dimensioned to receive the base end, the anchor part and sufficient cementing material to immerse the anchor part therein.

9. A bollard apparatus according to any preceding claim including said cementing material which is a grout material.

10. A bollard apparatus according to any preceding claim including said cementing material which has a compressive strength of between 50 N/mm^2 and 100 N/mm^2, preferably between 60 N/mm^2 and 80 N/mm^2 (Newtons per millimetre squared).

11. A bollard apparatus according to any preceding claim including said cementing material which has a flexural strength of between 5 N/mm^2 and 15 N/mm^2, preferably between 8 N/mm^2 and 11 N/mm^2 (Newtons per millimetre squared).

12. A bollard apparatus according to any preceding claim including said cementing material which has a static modulus of elasticity of between 15 N/mm^2 and 30 N/mm^2, preferably between 20 N/mm^2 and 25 N/mm^2 (Newtons per millimetre squared).

13. A bollard comprising said bollard apparatus according to any preceding claim in assembled form in which said base end of the bollard member is retained together with said cementing material in said housing part thereby cementing the bollard member to the foundation assembly within the housing part such that the inclination of the bollard member relative to the foundation assembly is fixed by the cementing material at a desired inclination.

14. A fixed vehicle barrier including one or more bollards according to claim 13 upstanding from a local ground level in which the foundation assembly is buried thereby to fix it to the local ground level.

15. A method of erecting a bollard for use as a fixed vehicle barrier including:

providing a bollard assembly including:

bollard member having a base end; and,

a foundation assembly adapted for fixed ground engagement comprising a housing part dimensioned and arranged for housing the base end of the bollard member together with cementing material;

enclosing the base end within the housing part;

engaging the foundation assembly with a ground surface with the bollard member upstanding;

placing cementing material within the housing part;

adjusting the inclination of the bollard member relative to the foundation assembly to a desired inclination while the cementing material is not set;

allowing the cementing material to set thereby to cement the inclination of the bollard member relative to the foundation assembly.

16. A shallow-mountable bollard assembly comprising:

a foundation assembly comprising a plate member arranged for ground engagement and shaped to define a plurality of tongue portions each separated from a neighbouring tongue portion by an intermediate bridging portion extending transversely therebetween; and,

a plurality of bollard members each fixed to the plate member at a respective position thereupon in register with a respective one of the tongue portions such that the tongue portion projects in a direction transverse to the length of the bollard member.

17. A shallow-mountable bollard assembly according to claim 16 in which each of the tongue portions is located at a common side of the plate member.

18. A shallow-mountable bollard assembly according to claim 16 or 17 comprising no more than two said tongue portions.

19. A shallow-mountable bollard assembly according to claim 16 or 17 comprising no more than four said tongue portions.

20. A shallow-mountable bollard assembly according to any of claims 16 to 19 comprising the bollard apparatus of any of claims 1 to 12 or the bollard of claim 13.

21. A shallow-mountable bollard assembly according to any of claims 16 to 19 in which the bollard members are welded to the plate member.

22. A method of manufacturing a shallow-mountable bollard apparatus comprising:

providing a rectangular plate;

cutting the rectangular plate in to two plate halves each reciprocally shaped to define a plurality of tongue portions each separated from a neighbouring tongue portion by an intermediate bridging portion extending transversely therebetween; and,

removing from at least one of the two plate halves parts excess plate parts which are neither a tongue portion or a bridging portion thereby to define a plate member for ground engagement; and,

fixing each of a plurality of bollard members to one of the plate members at a respective position thereupon in register with a respective one of the tongue portions such that the tongue portion projects in a direction transverse to the length of the bollard member.

23. A method according to claim 22 including the rectangular plate in to two halves each reciprocally shaped to define four said tongue portions.

24. A bollard apparatus or vehicle barrier or shallow-mountable bollard assembly according to any of claims 1 to 14, or 16 to 21 in which said foundation assembly comprises at least one rib member attached thereto along a surface thereof to strengthen the foundation member against bending transversely to the rib.

25. A shallow-mountable bollard assembly according to any of claims 16 to 21 in which said foundation assembly comprises at least one rib member attached thereto along a surface of one or each tongue member thereof to strengthen the tongue member against bending transversely to the rib.

26. A shallow-mountable bollard assembly according to claim 25 in which said foundation assembly comprises at least one rib member attached thereto along a surface of the intermediate bridging portion thereof to strengthen the bridging portion against bending transversely to the rib.

CLAIMS:

1. A bollard apparatus for use as a fixed vehicle barrier including:

a bollard member having a base end; and,

a foundation assembly adapted for fixed ground engagement;

wherein the foundation assembly comprises a housing part dimensioned and arranged for retaining the base end of the bollard member together with cementing material for cementing the bollard member to the foundation assembly within the housing part such that the inclination of the bollard member relative to the foundation assembly is adjustable while the cementing material is not set and is fixed upon the cementing material becoming set thereby to cement the inclination of the bollard member relative to the foundation assembly;

wherein the foundation assembly includes an aperture arranged in register with the housing part and dimensioned to admit therethrough parts of the bollard member so as to extend from within the housing part between the base end of the bollard member and a top end of the bollard member in a direction transverse to the foundation assembly, and a transverse dimension of the base end of the bollard member exceeds a corresponding transverse dimension of the aperture such that the base end of the bollard is thereby prevented from passing through the aperture from within the housing part.

2. A bollard apparatus according to claim 1 in which a transverse dimension of the aperture exceeds a corresponding transverse dimension of those parts of the bollard member which the aperture is arranged to admit by an amount sufficient to define a gap therebetween within which the bollard member is moveable to adjust its inclination relative to the foundation member.

3. A bollard apparatus according to any of claims 1 to 2 in which a transverse dimension of the aperture exceeds a corresponding transverse dimension of those parts of the bollard member which the aperture is arranged to admit by an amount sufficient to define a gap therebetween through which said

cementing material is flowable to fill regions within housing part which surround the base end of the bollard member.

4. A bollard apparatus according to any of claims 1 to 3 in which the housing part defines a sump a transverse dimension of which exceeds a corresponding transverse dimension of the aperture such that parts of the foundation assembly defining the aperture appose internal surfaces of the sump therewith to define a chamber for receiving said cementing material.

5. A bollard apparatus according to any of claims 1 to 4 in which the foundation assembly includes a plate member having a through-opening containing a fixed collar member upstanding from plate member at the periphery of the through-opening thereby defining said aperture at the outermost end of the collar.

6. A bollard apparatus according to any preceding claim in which the bollard member includes an anchor part fixed adjacent the base end thereof and outwardly projecting therefrom in a direction transverse to the longitudinal axis thereof wherein the housing part is dimensioned to receive the base end, the anchor part and sufficient cementing material to immerse the anchor part therein.

7. A bollard apparatus according to any preceding claim including said cementing material which is a grout material.

8. A bollard apparatus according to any preceding claim including said cementing material which has a compressive strength of between 50 N/mm^2 and 100 N/mm^2 (Newtons per millimetre squared).

9. A bollard apparatus according to any preceding claim including said cementing material which has a compressive strength of between 60 N/mm^2 and 80 N/mm^2 (Newtons per millimetre squared).

10. A bollard apparatus according to any preceding claim including said cementing material which has a flexural strength of between 5 N/mm^2 and 15 N/mm^2 (Newtons per millimetre squared).

11. A bollard apparatus according to any preceding claim including said cementing material which has a flexural strength of between 8 N/mm^2 and 11 N/mm^2 (Newtons per millimetre squared).

12. A bollard apparatus according to any preceding claim including said cementing material which has a static modulus of elasticity of between 15 N/mm^2 and 30 N/mm^2 (Newtons per millimetre squared).

13. A bollard apparatus according to any preceding claim including said cementing material which has a static modulus of elasticity of between 20 N/mm^2 and 25 N/mm^2 (Newtons per millimetre squared).

14. A bollard comprising said bollard apparatus according to any preceding claim in assembled form in which said base end of the bollard member is retained together with said cementing material in said housing part thereby cementing the bollard member to the foundation assembly within the housing part such that the inclination of the bollard member relative to the foundation assembly is fixed by the cementing material at a desired inclination.

15. A fixed vehicle barrier including one or more bollards according to claim 14 upstanding from a local ground level in which the foundation assembly is buried thereby to fix it to the local ground level.

16. A method of erecting a bollard for use as a fixed vehicle barrier including:

providing a bollard assembly including:

bollard member having a base end; and,

a foundation assembly adapted for fixed ground engagement comprising a housing part dimensioned and arranged for housing the base end of the bollard member together with cementing material wherein the foundation assembly includes an aperture arranged in register with the housing part and dimensioned to admit therethrough parts of the bollard member so as to extend from within the housing part between the base end of the bollard

member and a top end of the bollard member in a direction transverse to the foundation assembly, and a transverse dimension of the base end of the bollard member exceeds a corresponding transverse dimension of the aperture such that the base end of the bollard is thereby prevented from passing through the aperture from within the housing part;

enclosing the base end within the housing part;

engaging the foundation assembly with a ground surface with the bollard member upstanding;

placing cementing material within the housing part;

adjusting the inclination of the bollard member relative to the foundation assembly to a desired inclination while the cementing material is not set;

allowing the cementing material to set thereby to cement the inclination of the bollard member relative to the foundation assembly.

17. A bollard apparatus or vehicle barrier according to any of claims 1 to 15, in which said foundation assembly comprises at least one rib member attached thereto along a surface thereof to strengthen the foundation member against bending transversely to the rib.

18. A bollard apparatus substantially as disclosed in the description and/or drawings hereinbefore.

19. A fixed vehicle barrier substantially as disclosed in the description and/or drawings hereinbefore.

20. A method substantially as disclosed in the description hereinbefore.