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(56) Documents Cited
GB 2243629 A **GB 1524516 A**
GB 1411062 A **EP 0810325 A2**
EP 0452205 A2 **WO 2001/090509 A1**

(58) Field of Search
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INT CL^7 **E01D** 19/00 19/10, **E01F** 15/04, **E04H** 17/14
Other: **Online: EPODOC, WPI, JAPIO**

(54) Abstract Title
Railing or parapet structure for a bridge

(57) A railing structure comprises a plurality of posts (11), having brackets (20) pivotally attached thereto which support rails (31), where the orientation of the brackets can be adjusted prior to fitting the rails. Each post may be welded to a base plate (12) such that the weld on the opposite side of the post to the rails (i.e. away from any potential impact) is weaker than the welds around the other sides of the post, or alternatively no weld is present on said opposite side (Figure 9). Preferably a metal shield (40, Figure 6) is placed between each bracket and rail to prevent any sham edges from shearing the rail in the event of an impact. A method of assembling such a railing structure is also disclosed.

A second aspect discloses a railing structure having a post welded to a base as described above.

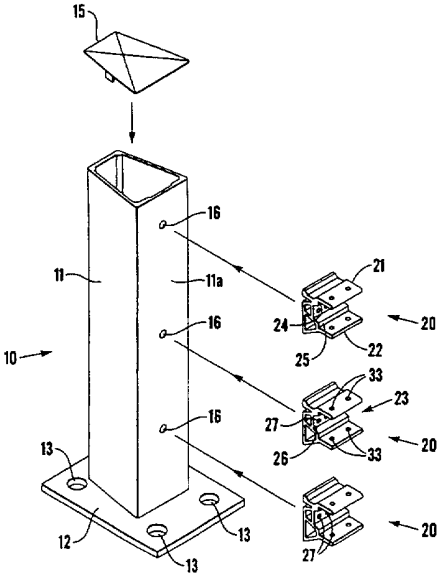

Fig. 1

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

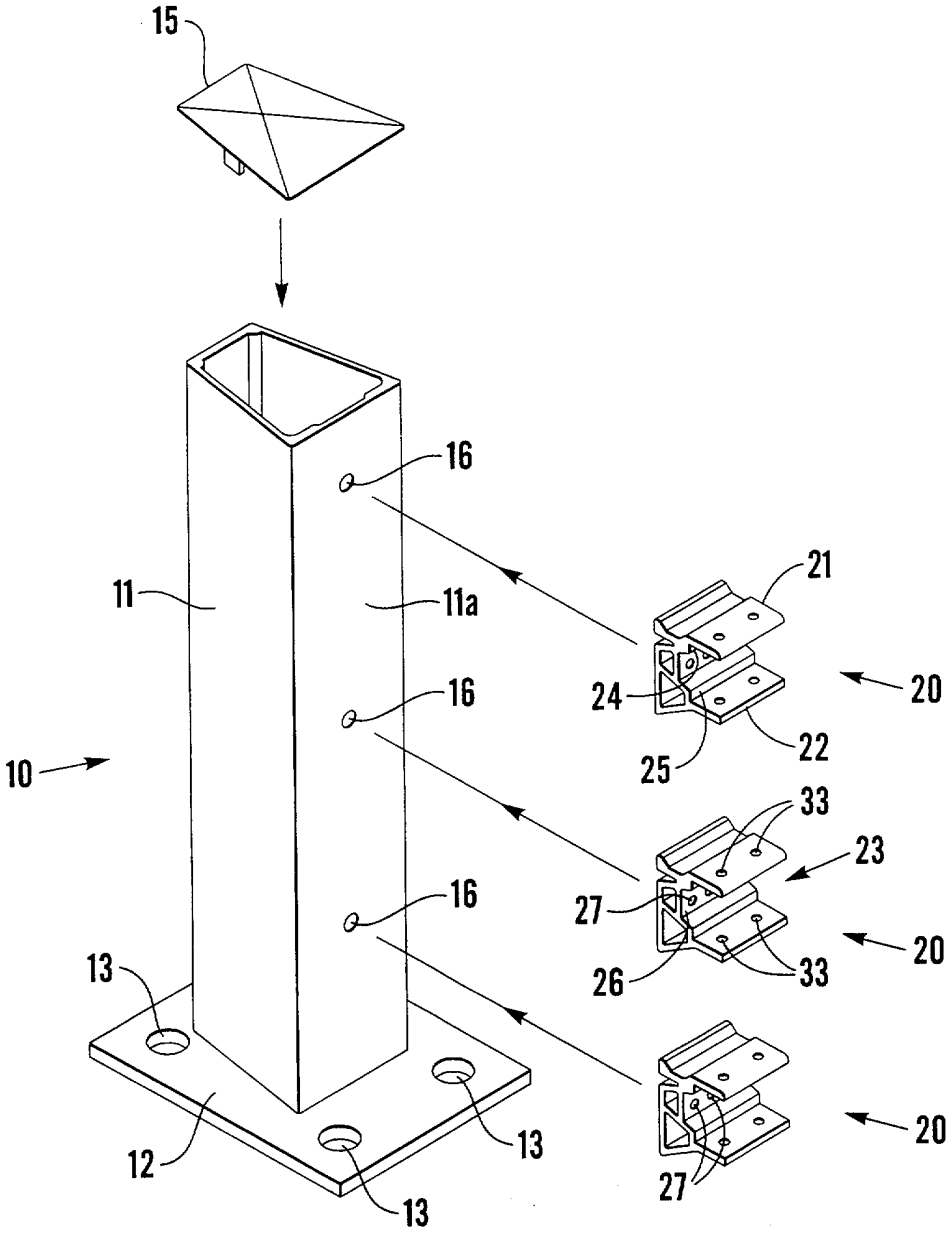

Fig. 1

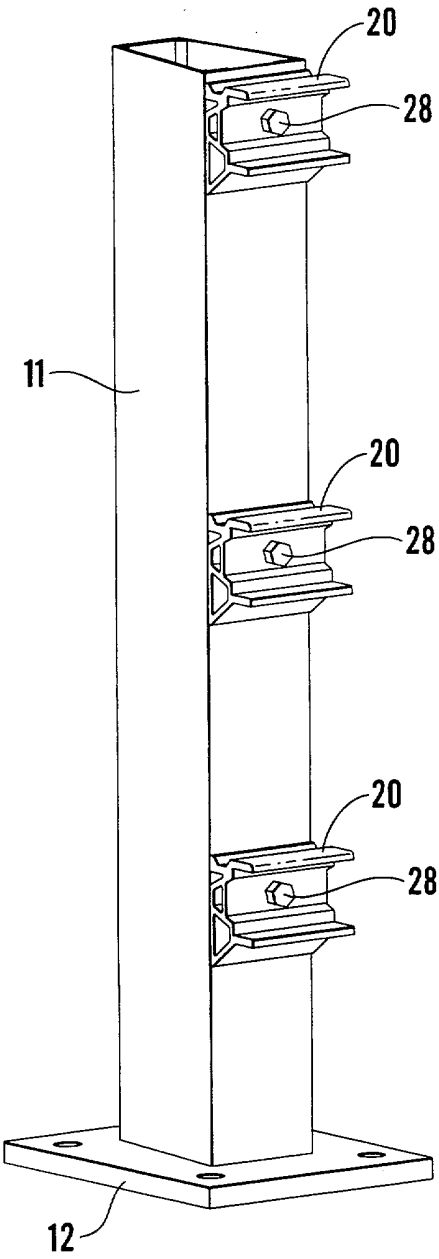

Fig.2

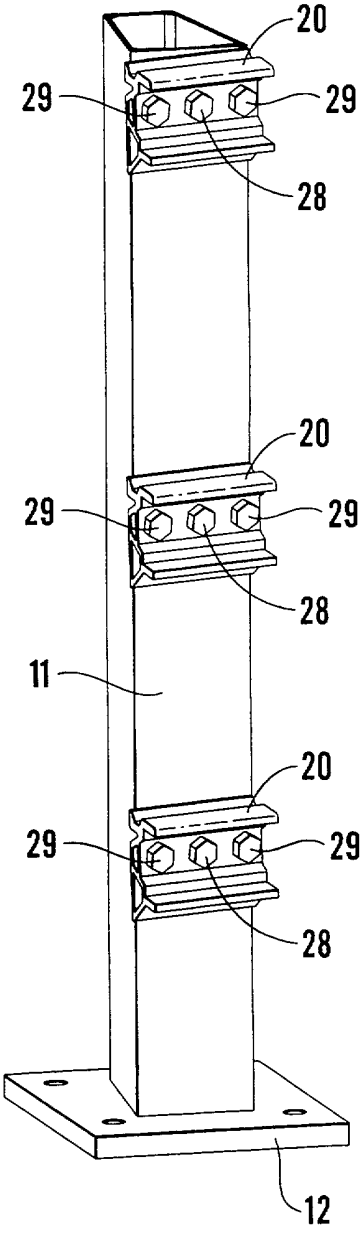

Fig.3

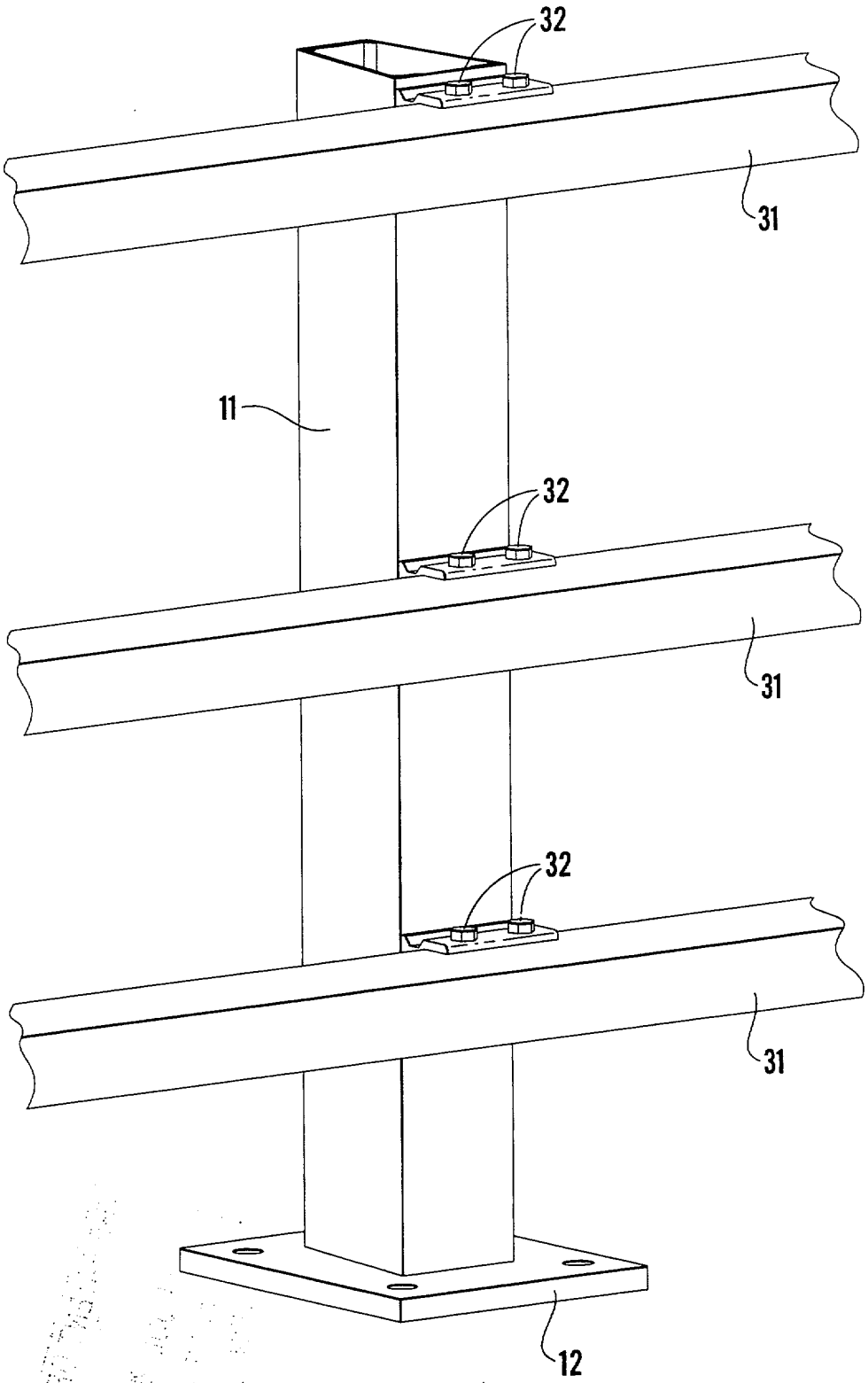

Fig.4

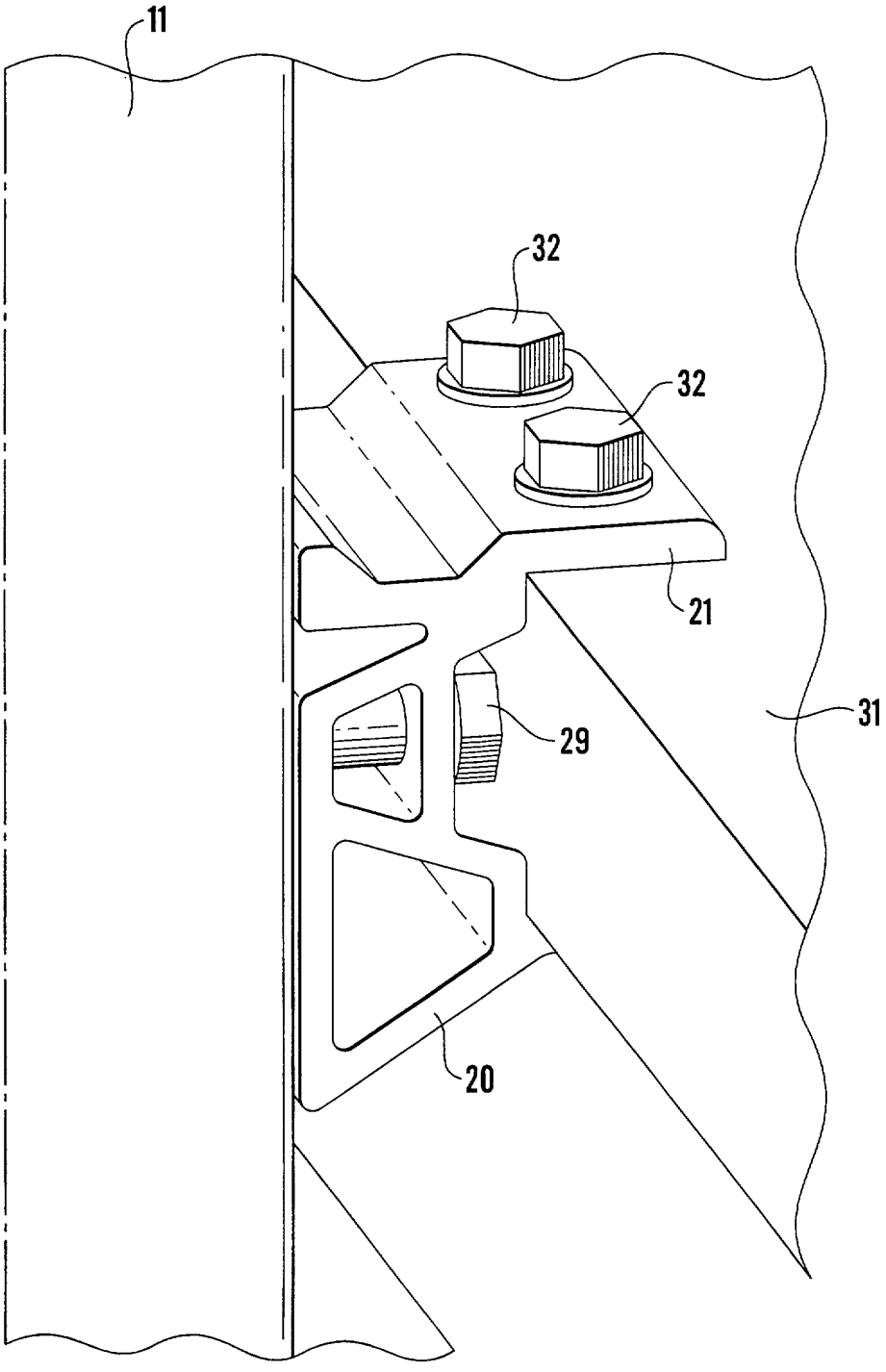

Fig.5

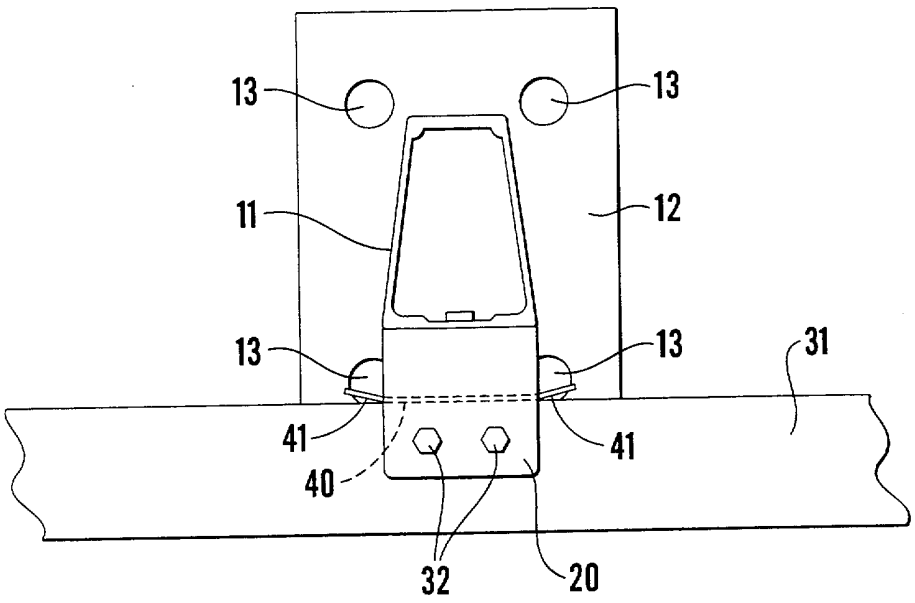

Fig.6

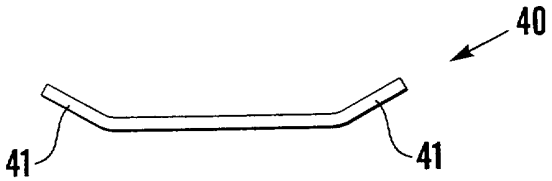

Fig.7

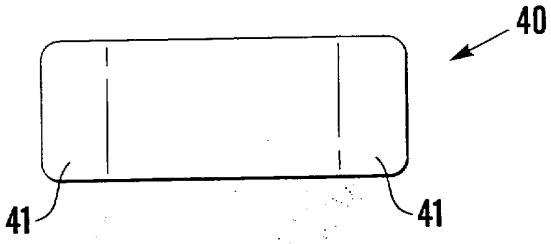

Fig.8

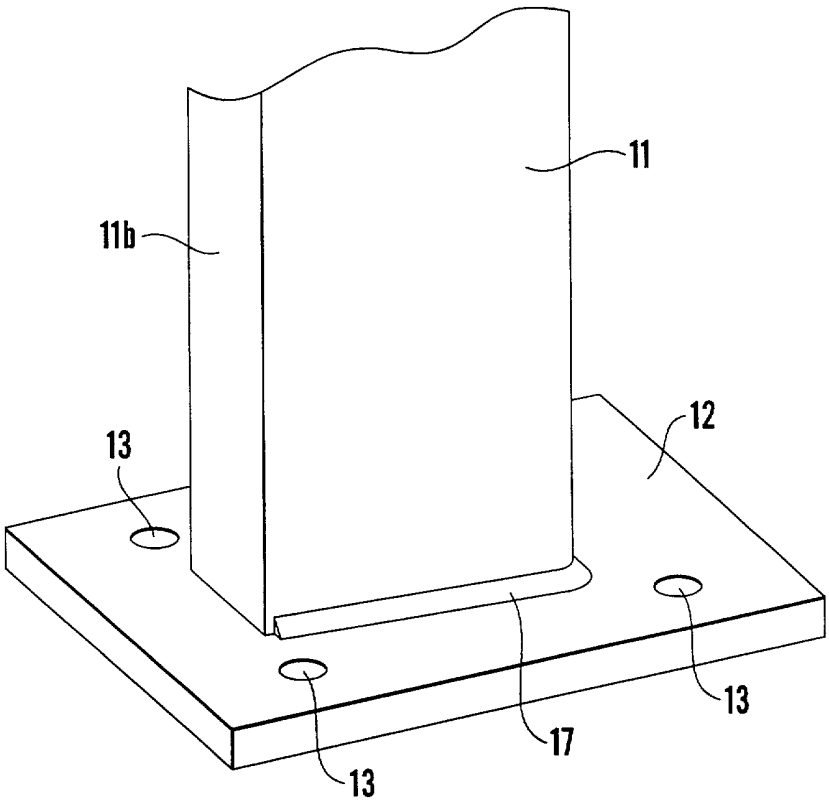

Fig.9

Title – Improvements in and relating to railings and parapets

This invention relates to improvements in and relating to railings and parapets, and in particular to improved forms of bridge parapet that offer advantages, particularly in terms of ease of erection.

Parapets in the form of railings are very commonly installed on bridges of all sorts, in particular road bridges. The parapets serve to increase safety, in that they act as a barrier to restrain an impacting vehicle and prevent it falling from the bridge.

A bridge parapet typically comprises a series of vertical support posts spaced at intervals along the top of a side wall (plinth) of the bridge, the support posts carrying one or more rails disposed parallel to the adjacent road or pavement level.

Usually, a bridge is arched or inclined to a greater or lesser extent, and the parapet rails must generally follow the adjacent pavement level. This means that the precise angles at which the rails are connected to the support posts may vary along the length of the bridge. A disadvantage of known forms of bridge parapet is that these angles must be determined prior to installation of the parapet and accurate connections formed in advance. The parapet must then be assembled in accordance with the detailed plans drawn up beforehand. This obviously complicates the manufacture of the parapet and also leads to increased risk of misassembly of the parapet and increased installation times.

There has now been devised an improved form of bridge parapet that overcomes or substantially mitigates the above-mentioned and/or other disadvantages of the prior art.

According to a first aspect of the invention, there is provided a railing or parapet structure suitable for a bridge or the like, which parapet structure comprises a plurality of upright support elements and one or more connecting rails disposed between, and supported by, successive support elements, said rails being connected to said support elements by means of brackets fixed to said support elements, wherein said brackets are pivotally mounted on said support elements in such a manner that the orientation of said brackets relative to said support elements can be adjusted prior to fitting of said rails to said brackets.

In accordance with a second aspect of the invention, there is provided a support element for a railing or parapet structure according to the first aspect of the invention, said support element comprising an upright post on which is pivotally mounted at least one bracket, the orientation of said bracket relative to said post being adjustable.

According to a third aspect of the invention, there is provided a method of assembly of a railing or parapet structure for a substrate such as a bridge or the like, which method comprises the steps of

(a) installing a plurality of upright support elements on said substrate,

(b) either before or after step (a), pivotally mounting at least one bracket on said support elements in such a way that the orientation of said brackets relative to said support elements can be adjusted,

(c) orienting said brackets relative to the support elements to which they are fitted, in conformity with the form of the substrate, and

(d) fixing connecting rails to the brackets on successive support elements.

The pivotal mounting of the brackets on the support elements is most preferably achieved by mounting of the brackets by means of central bolts or pins about which the brackets may be rotated, through at least a sufficient arc to accommodate all different orientations that may, in use, be necessary or desirable.

Preferably, once the bracket has been adjusted to its desired orientation, that orientation is fixed. Most preferably, mechanical fasteners, eg threaded bolts or screws, are used for this purpose.

The bracket most preferably comprises a pair of limbs, which between them define a channel within which a parapet rail can be received.

The support element will generally be an upstanding post. The post is preferably provided with a baseplate or flange by means of which it can be fastened to the substrate, eg by means of bolts or other fasteners in a manner known *per se*. The post is preferably of hollow construction.

The support element and bracket may be made of any suitable materials. However, it is preferred, for reasons of mechanical strength and durability, that the components of the parapet structure be of metal. Aluminium is a particularly preferred material, and both the support element and the bracket are preferably formed at least in part by extrusion processes. Steel is another material that may be used.

Where the support element and baseplate are made of metal, they are preferably fixed together by welding. Preferably, the support element is welded such that the weld between the wall of the support element that is facing away from the rails, and therefore any impact, and the baseplate is weaker than the welds between the other walls of the support element and the baseplate. Most preferably, the wall of the support element that is facing away from the rails is not welded to the base plate. Surprisingly, this increases the effectiveness of the assembled railing or parapet structure at containing any vehicle which impacts upon it.

Thus, according to a different aspect of the invention, there is provided a railing or parapet structure suitable for a bridge or the like, which parapet structure comprises a plurality of upright metal support elements and one or more connecting rails disposed between, and supported by, successive support elements, the support elements being welded at the lower ends thereof to metal baseplates, wherein the weld at the rear of the support element is of reduced strength compared to the weld at the front and sides. Preferably, the weld at the rear of the support element is absent.

The railing or parapet structure according to the invention is advantageous primarily in that the adjustability of the brackets facilitates the mounting of the connecting rails in accordance with the site gradient, without the need for the correct orientation to be determined and fixed beforehand. This greatly simplifies assembly and reduces the likelihood of errors being made during installation of the railing or parapet structure.

Particularly where the bracket is formed by cutting a length of metal, for example aluminium extrusion, it may have relatively sharp edges which may increase the risk of the rail shearing in the event of an impact. For this reason, the railing or parapet structure is preferably provided with shields positioned between the rails and the brackets, the shields preferably being substantially planar. The two major surfaces of the shield preferably abut the bracket and the side of the rail facing the support element respectively. The longitudinal axis of the shield is preferably parallel to that of the rail. The shield is preferably formed from a sheet of metal, most preferably aluminium.

The shield preferably has extensions at each end thereof which project outwardly from the bracket and most preferably from either end of the channel defined by the bracket. The extensions preferably gradually increase in distance from the plane of the shield and hence the side of the rail. The extensions may gradually increase in distance from the rail by virtue of having straight sides that are

disposed at an angle to the plane of the shield, or curved sides. In general, the extensions may take any form provided that a relatively sharp edge does not exist close to the rail. The extensions are most preferably tapered. The angle of taper is preferably between 3° and 30° to the plane of the shield, more preferably between 3° and 20°, and especially between 3° and 10°, eg 5° to 7°.

A shield as described above eliminates the sharp edge at either side of the bracket which would ordinarily abut the rail and at which, in use, the rail could shear.

The invention will now be described in greater detail, by way of illustration only, with reference to the accompanying drawings, in which

Figure 1 is an exploded view of a parapet support post according to the invention and three spacer brackets by which the support post is connected to parapet rails;

Figure 2 is a perspective view of the post of Figure 1 with the spacer brackets pivotally attached;

Figure 3 is a view similar to Figure 2, showing the spacer brackets fixed in a final orientation;

Figure 4 is a perspective view showing an assembled parapet comprising three parapet rails fixed to the support post;

Figure 5 is a detailed view of the connection of one rail to the support post via a spacer bracket;

Figure 6 is a plan view, showing hidden detail, of the assembled parapet of Figure 4 including a shield;

Figure 7 is a plan view of the shield;

Figure 8 is a front view of the shield; and

Figure 9 is a detailed view of the lower end of the support post fixed to a baseplate.

Referring first to Figure 1, a bridge parapet support is generally designated 10 and comprises a hollow post 11 that is fixed to a baseplate 12. The post 11 is of trapezoidal cross-section, having two parallel walls, of which the more extensive is denoted 11a. The baseplate 12 is formed with four fixing bores 13 by which the support 10 can be secured to a substrate using bolts or the like (not shown) in a manner known *per se*. The support 10 is completed by a cap 15, which engages in the open upper end of the post 11 and is fixed in place by means of pop rivets or welding. The cap 15 is normally factory-fitted, but is omitted from Figures 2 to 4.

The post 11 and baseplate 12 are formed in aluminium. Wall 11a and the two non-parallel side walls of the post 11 are welded at their lower edges to the baseplate 12. The less extensive wall 11b of the two parallel walls of the post 11 is not welded to the baseplate, as shown in Figure 9 in which the weld (that extends around the junction of three walls of the post 11 with the baseplate 12) is denoted 17. Surprisingly, the omission of a weld at wall 11b, which is facing away from the rails and therefore any impact, increases the effectiveness of the assembled railing or parapet structure at containing any vehicle which impacts upon it. In other embodiments of the invention, the weld between the lower edge of wall 11a and the baseplate 12 may be reinforced by an aluminium buttress.

The more extensive wall 11a of the two parallel walls of the post 11 is formed with three bores 16 that are spaced apart along the longitudinal axis of that

wall 11a. Threaded nuts (not visible in the drawings) are fixed to the internal surface of the wall 11a, in registration with the three bores 16, so that threaded bolts passing through the bores 16 can be engaged with the nuts, as described below.

The post 11 is used in conjunction with three spacer brackets 20, which are of identical form. Each spacer bracket 20 is an integral component cut from a length of aluminium extrusion. The width of the spacer bracket 20 corresponds approximately to the width of the wall 11a of the post 11.

The spacer bracket 20 is formed with upper and lower limbs 21,22 which between them define a generally C-shaped channel 23 within which a parapet rail is received as described below. The side wall of the channel 23 is formed with a pair of shoulders 24,25 (most clearly visible in Figure 5) which between them define a central recess 26. Three bores 27 are provided within the wall of the recess 26, those bores 27 being aligned with corresponding bores in the face of the spacer bracket 20 that, in use, abuts the wall 11a of the post 11.

In a first stage of assembly, the spacer brackets 20 are fitted to the support 10 by means of threaded bolts 28 that are passed through the central bore 27 (and the corresponding bore in the rear face of the spacer bracket 20) and through one of the bores 16 and into engagement with the corresponding threaded nut. The bolts 28 are tightened to a predetermined torque. The heads of the bolts 28 are accommodated within the central recess 26. In this way, each spacer bracket 20 is adjustably connected to the support 10. The support 10, having three spacer brackets 20 attached to it, is shown in Figure 2. The support 10 will normally be supplied from the factory in this pre-assembled condition, in which the spacer brackets 20 can be adjusted to their final alignment simply by rotation about the bolts 28. Alternatively, the support 10 could be supplied without the spacer brackets 20 being fitted at all, the brackets 20 being fitted only after the support 10 has been fixed in position on the bridge on which a parapet is being installed.

After delivery to the installation site, the support 10 is fixed in position by means of bolts or the like passed through the fixing bores 13 provided in the baseplate 12. Once the requisite number of supports 10 is in position, the spacer brackets 20 are adjusted to their final, desired alignment. After adjusting the alignment of each spacer bracket 20, the alignment of the bracket 20 can then be fixed permanently by drilling and tapping the wall 11a, through the outer bores 27 in the wall of the recess 26. Set screws 29 (see Figure 3) can then be inserted into the outer bores 27 and engaged with the post 11.

Once the spacer brackets 20 have been fixed in the desired orientations, rails 31 are placed in position as shown in Figures 4 and 5. The rails 31 are offered up to the spacer brackets 20 and inserted into the channel 23 defined between the limbs 21,22 so that the rear face of the rail 31 abuts the shoulders 24,25. The fit between the rail 31 and the limbs 21,22 may be sufficiently close for the rail 31 to be held temporarily in place. Pairs of holes are then drilled through the upper and lower walls of the rail 31, through pre-drilled holes 33 in the upper and lower limbs 21,22 of the spacer bracket 20. These holes are thus used as a template to drill through upper and lower surfaces of the rail 31, thus accounting for any longitudinal discrepancies in positioning of the posts 10. Through bolts 32 and locking nuts (not visible) are then fitted, to a predetermined torque, to secure the rails 31 to the spacer brackets 20.

Turning now to Figure 6, the assembled parapet may be provided with shields 40, which are positioned between the rear faces of the rails 31 and the shoulders 24,25 (not visible in Figure 6) of the spacer brackets 20.

Such a shield 40 is illustrated more clearly in Figures 7 and 8. The shield 40 is formed from a metal sheet, preferably aluminium, of approximately 3mm thickness. The shield 40 is rectangular in shape with rounded edges and comprises a main body and two end sections 41 at each end thereof. The two

end sections 41 are each disposed at a similar angle, relative to the plane of the main body of the shield 40. The angle between each angled end section 41 and the main body is typically of the order of 6° (exaggerated in the Figures for clarity).

As shown in Figure 6, the shield 40 is dimensioned such that the main body is of a similar length to the width of the spacer bracket 20 and, when assembled, the end sections 41 project outwardly from the sides of the spacer bracket 20. In the assembled parapet, the shield 40 is arranged with the end sections 41 angled away from the rail 31.

In use, a vehicle may impact on the assembled parapet. A shield 40 as described above eliminates the sharp edge at either side of the spacer bracket 20 which would ordinarily abut the rail and at which the rail 31 could shear. The shield 40 may therefore increase the capacity of the assembled parapet in load capacity and deflection capacity, compared with a parapet assembled without shields 40.

Claims

1. A railing or parapet structure suitable for a bridge or the like, which parapet structure comprises a plurality of upright support elements and one or more connecting rails disposed between, and supported by, successive support elements, said rails being connected to said support elements by means of brackets fixed to said support elements, wherein said brackets are pivotally mounted on said support elements in such a manner that the orientation of said brackets relative to said support elements can be adjusted prior to fitting of said rails to said brackets.

2. A railing or parapet structure as claimed in Claim 1, wherein the brackets are pivotally mounted on the support elements by means of central bolts or pins.

3. A railing or parapet structure as claimed in any preceding claim, wherein the orientation of the bracket may be fixed once the bracket has been adjusted to its desired orientation.

4. A railing or parapet structure as claimed in Claim 3, wherein the orientation of the bracket is fixed by mechanical fasteners.

5. A railing or parapet structure as claimed in any preceding claim, wherein the bracket comprises a pair of limbs, which between them define a channel within which the connecting rail is received.

6. A railing or parapet structure as claimed in any preceding claim, wherein the components of the railing or parapet structure are formed in metal.

7. A railing or parapet structure as claimed in Claim 6, wherein both the support element and the bracket are formed in aluminium, at least in part by extrusion processes.

8. A railing or parapet structure as claimed in any preceding claim, wherein the support element is an upstanding post which is provided with a baseplate or flange by means of which it can be fastened to the substrate.

9. A railing or parapet structure as claimed in Claim 8, wherein the post is of hollow construction.

10. A railing or parapet structure as claimed in Claim 8 or Claim 9, wherein the support element and baseplate are formed in metal and are fixed together by welding.

11. A railing or parapet structure as claimed in Claim 10, wherein the support element is welded such that the weld between the wall of the support element that is facing away from the rails, and therefore any impact, and the baseplate is weaker than the welds between the other walls of the support element and the baseplate.

12. A railing or parapet structure as claimed in Claim 11, wherein the wall of the support element that is facing away from the rails is not welded to the base plate.

13. A railing or parapet structure as claimed in any preceding claim, wherein the railing or parapet structure is provided with substantially planar shields positioned between the rails and the brackets, with the two major surfaces of the shield abutting the bracket and the side of the rail facing the support element respectively.

14. A railing or parapet structure as claimed in Claim 13, wherein the shield is formed from a sheet of metal.

15. A railing or parapet structure as claimed in Claim 13 or Claim 14, wherein the shield has extensions at each end thereof which project outwardly from the bracket.

16. A railing or parapet structure as claimed in Claim 15, wherein the extensions gradually increase in distance from the plane of the shield and hence the side of the rail.

17. A railing or parapet structure as claimed in Claim 16, wherein the extensions are tapered and have an angle of taper of between 3° and 30° to the plane of the shield.

18. A railing or parapet structure as claimed in Claim 17, wherein the angle of taper is between 3° and 10°.

19. A support element for a railing or parapet structure, said support element comprising an upright post on which is pivotally mounted at least one bracket, the orientation of said bracket relative to said post being adjustable.

20. A support element as claimed in Claim 19, wherein the bracket is pivotally mounted on the support element by means of a central bolt or pin.

21. A support element as claimed in any preceding claim, wherein the orientation of the bracket may be fixed once the bracket has been adjusted to its desired orientation.

22. A support element as claimed in Claim 21, wherein the orientation of the bracket is fixed by mechanical fasteners.

23. A support element as claimed in any preceding claim, wherein the bracket comprises a pair of limbs, which between them define a channel within which a connecting rail can be received.

24. A support element as claimed in any preceding claim, wherein the support element is provided with a baseplate or flange by means of which it can be fastened to the substrate.

25. A support element as claimed in Claim 24, wherein the post is of hollow construction.

26. A support element as claimed in any preceding claim, wherein the components of the support element are formed in metal.

27. A support element as claimed in Claim 26, wherein both the upright post and the bracket are formed in aluminium, at least in part by extrusion processes.

28. A method of assembly of a railing or parapet structure for a substrate such as a bridge or the like, which method comprises the steps of

(a) installing a plurality of upright support elements on said substrate,

(b) either before or after step (a), pivotally mounting at least one bracket on said support elements in such a way that the orientation of said brackets relative to said support elements can be adjusted,

(c) orienting said brackets relative to the support elements to which they are fitted, in conformity with the form of the substrate, and

(d) fixing connecting rails to the brackets on successive support elements.

29. A method of assembly as claimed in Claim 28, wherein the method further comprises the step of fixing the orientation of the bracket once the bracket has been adjusted to its desired orientation.

30. A railing or parapet structure suitable for a bridge or the like, which parapet structure comprises a plurality of upright metal support elements and one or more connecting rails disposed between, and supported by, successive support elements, the support elements being welded at the lower ends thereof to metal baseplates, wherein the weld at the rear of the support element is of reduced strength compared to the weld at the front and sides.

31. A railing or parapet structure as claimed in Claim 30, wherein the weld at the rear of the support element is absent.

32. A railing or parapet structure substantially as hereinbefore described, and as illustrated in any of the accompanying Figures.

33. A support element substantially as hereinbefore described, and as illustrated in any of the accompanying Figures.

Application No: GB 0213613.3
Claims searched: 1-29, 32 & 33

Examiner: Joanne Pullen
Date of search: 28 October 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): E1D DF172, DLCKM, DLCKN. E1G GLM. B3R RWB

Int Cl (Ed.7): E04H, E01D. E01F.

Other: Online: EPODOC, WPI, JAPIO.

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, Y	GB 2243629 A	(LAWLOR et al) Whole document.	X 19-23 Y 6-10 & 24-27
Y	GB 1524516 A	(BRITISH ALUMINIUM) Figures and page 2 lines 37-41.	6-10 & 24-27
X, Y	GB 1411062 A	(BAUMANN) Whole document.	X 1-4, 6, 19-22, 26, 28 & 29 Y 7-10, 24, 25 & 27
X,P	WO 01/90509 A1	(TATLOCK) Figures and page 3 lines 1-3	1, 3-6, 8, 9, 19 & 21-26
X, Y	EP 0810325 A2	(AUTOSTRADA DEL BRENNERO) Whole document.	X 1-4, 6, 19-22, 26, 28 & 29 Y 7-10, 24, 25 & 27

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.

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Date of search: 28 October 2002

Category	Identity of document and relevant passage	Relevant to claims
X, Y	EP 0452205 A2 (PROFILES DU CENTRE) Abstract and figures	X 1-5, 19-23, 28 & 29 Y 6-10 & 24-27

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.