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(56) Documents Cited:
EP 1627956 A1 **DE 020106675 U1**
DE 020017123 U1 **FR 002846673 A**

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UK CL (Edition X) **E1G**
INT CL **E01F**
Other: **ONLINE:WPI,EPODOC**

(54) Abstract Title: **Rail for use with road safety barrier**

(57) The rail, particularly for use near sensitive or dangerous structures or areas near roads such as bridge supports, comprises a section 40 at least part of which is convex, behind which is fitted a profile 34, at least of which fits into the rear of the convex part of the section. The profile preferably may comprise a C- or I-section with the horizontal flanges extending into the convex part(s) of the section. The section is preferably a W-section. Also claimed is a vehicle safety barrier and a kit for assembly into a rail for a safety barrier.

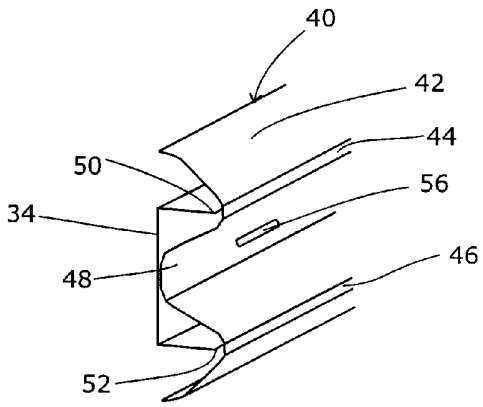

Fig 2

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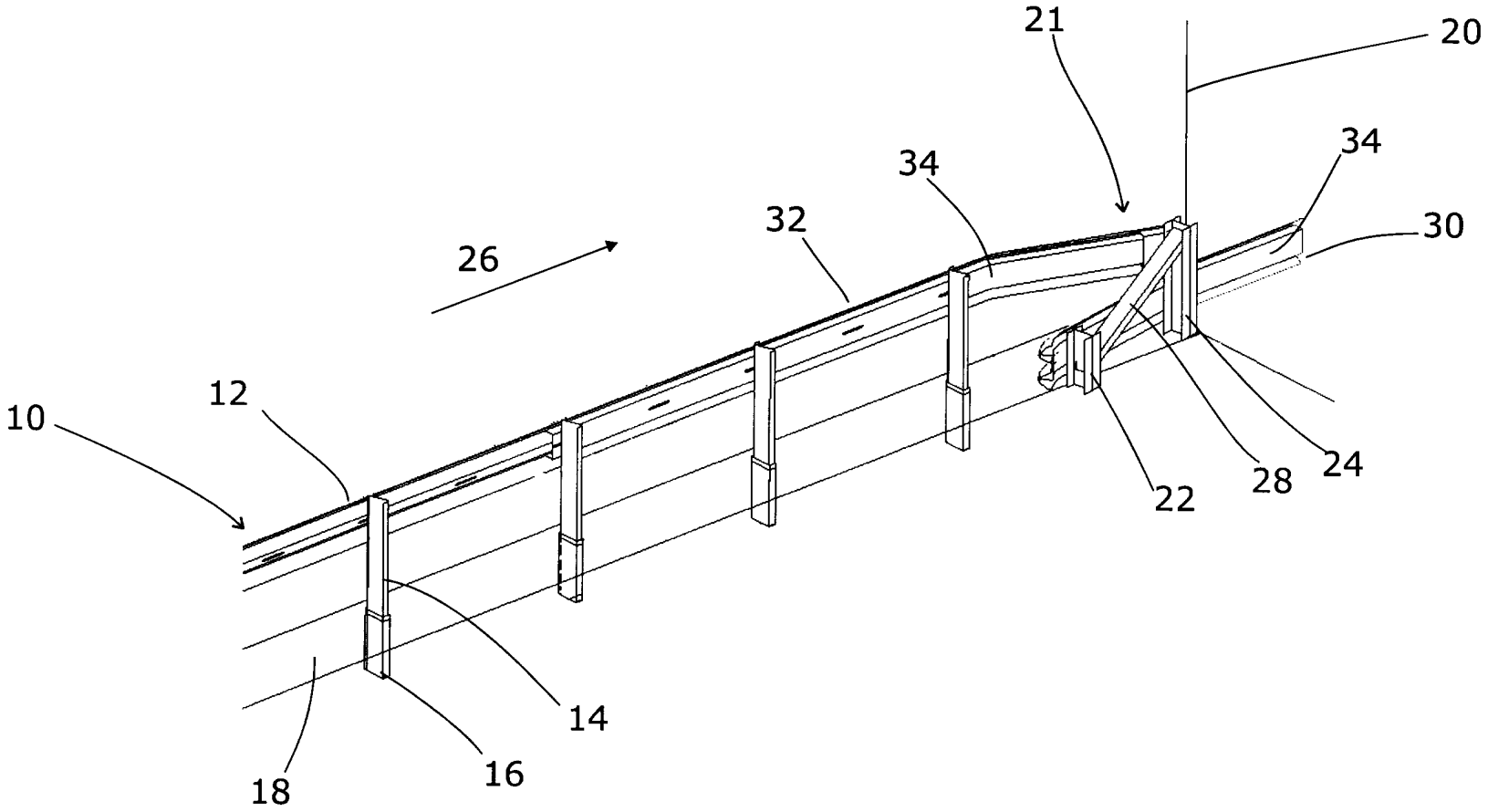

Fig 1

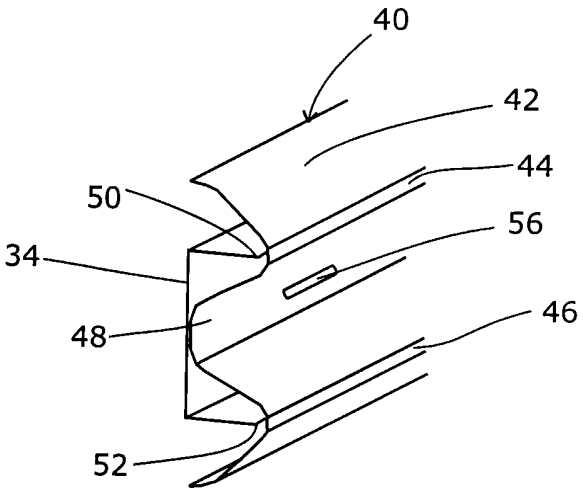

Fig 2

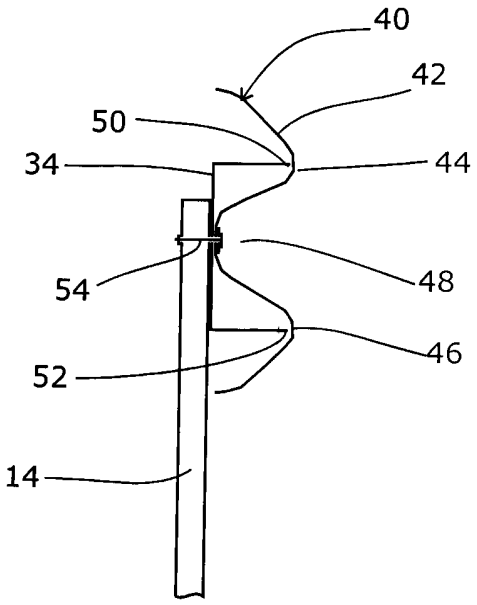

Fig 3

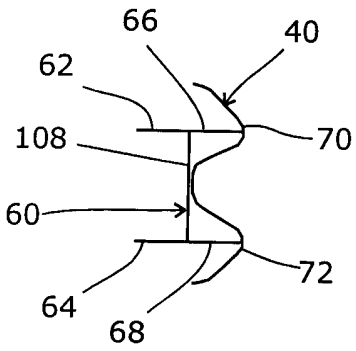

Fig 4

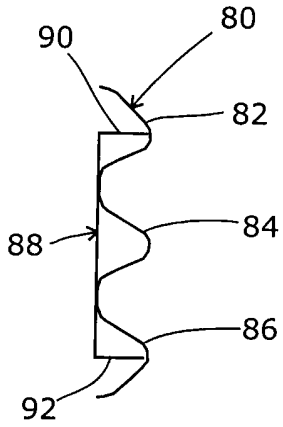

Fig 5

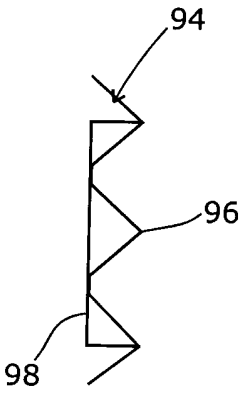

Fig 6

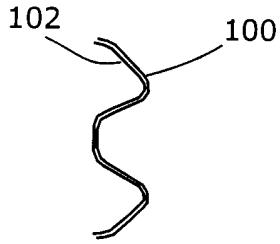

Fig 7

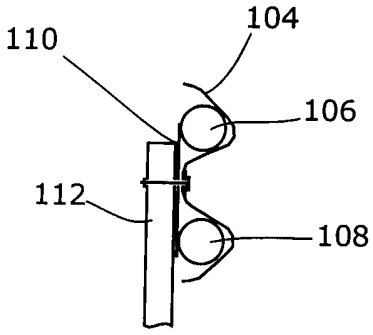

Fig 8

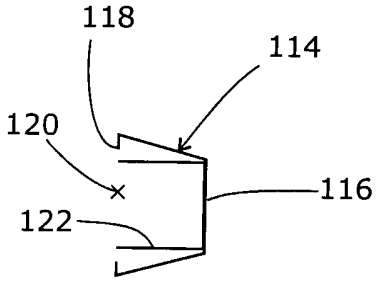

Fig 9

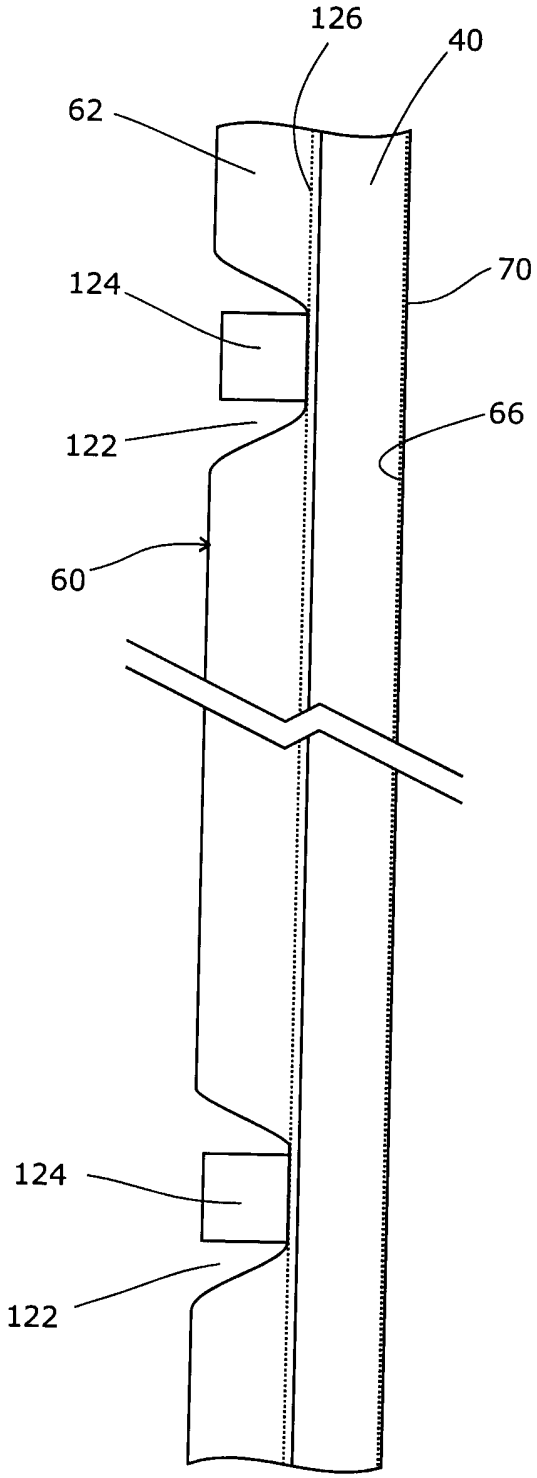
126
40
62
70
124
66
122
60
124
122

Fig 10

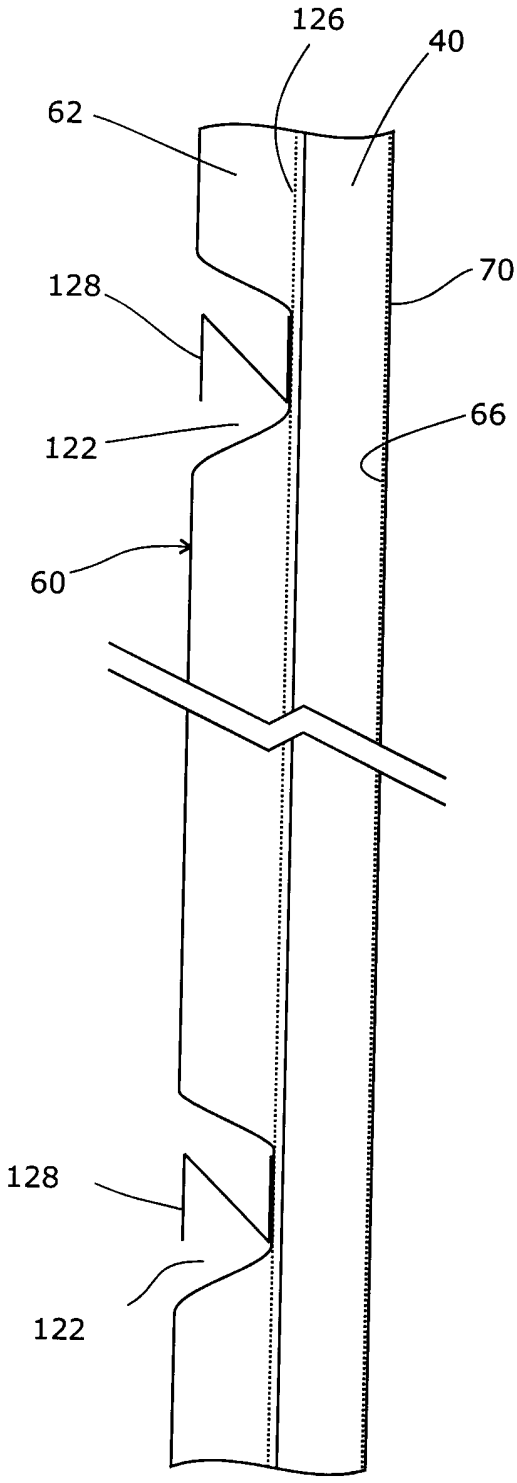
126
40
62
70
128
66
122
60
128
122

Fig 11

Rail for Vehicle Safety Barriers

FIELD OF THE INVENTION

The present invention relates to vehicle safety barriers.

BACKGROUND ART

Vehicle safety barriers for road use typically comprise one or more horizontal rails supported by posts spaced along the roadside. If a vehicle leaves the roadway for some reason, it impacts the rail and is restrained. Such barriers are a common sight on roads (etc) and are often referred to generically as "Armco"(RTM).

Extensive testing has been carried out in respect of such barriers in order to ensure that they withstand impact and redirect the vehicle safely. As a result, such barriers are used extensively where there are sensitive or dangerous structures or areas near to the roadway. An example is a support for a bridge over the roadway; if a vehicle were to leave the roadway and impact the bridge support then a potentially serious incident could result. A barrier serves to deflect the vehicle away from a course that would otherwise result in an impact.

Different types of hazard call for lesser or greater levels of restraint on the part of the barrier, and different designs have been developed corresponding to these different levels.

SUMMARY OF THE INVENTION

The present invention therefore provides a rail for a vehicle safety barrier, comprising a section at least part of which is convex, behind which is fitted a profile at least part of which fits into the rear of the convex section. The profile may fit entirely within the space behind such a cenvex portion, or it may have a protrusion which fits into the rear of the convex section. This offers a simple and straightforward way of upgrading an existing corrugated section rail when required, and also offers a rail that it easy and economic to install when new. The protrusions can comprise horizontally extending flanges, such as those of a C- or I-section. In use, the flanges or the free ends of the C- or I-section profile generally extend into the rear of the corrugations. The corrugated section can be, for example, a W-section profile.

The invention also provides a vehicle safety barrier comprising such a rail. The rail can be secured to a supporting post via at least one fixing that passes through a central part of the section and the profile. Such fixing is generally sufficient and in most applications no further fixing is needed.

Finally, the invention provides a kit for assembly into a rail for a vehicle safety barrier, comprising a corrugated section and a profile having horizontally extending flanges whose free edges fit into the recesses defined by the rear of the corrugations.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the present invention will now be described by way of example, with reference to the accompanying figures in which;

Figure 1 shows a perspective view of a vehicle safety barrier including a reinforced rail according to the present invention;

Figure 2 shows a perspective view of the reinforced rail in more detail;

Figure 3 shows a vertical section through the reinforced rail; and

Figure 4 shows a vertical section through a rail with an alternative reinforcement;

Figure 5 shows a vertical section through an alternative rail with reinforcement;

Figure 6 shows a vertical section through a further alternative rail with reinforcement;

Figure 7 shows a vertical section through a rail with a further alternative reinforcement;

Figure 8 shows a vertical section through a further alternative means of reinforcement; and

Figure 9 shows a vertical section through the reinforcement of a further alternative rail;

Figure 10 shows a view from above of a rail according to figure 4;

Figure 11 shows a view from above of a rail according to figure 4 with an alternative support.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Figure 1 shows a safety barrier and a barrier termination according to the present invention. This is described and claimed in our two copending applications filed simultaneously with this application and each entitled "Vehicle Safety Barriers", and the disclosures of which is hereby incorporated by reference. A standard W-section safety barrier 10 is shown, which consists of a W-section rail 12 supported by posts 14. Each post 14 is set into a socket 16 that is embedded in the ground surface 18; other means of securing the posts are also known, such as driving the socket directly into the ground. In the arrangement shown in figure 1, the barrier 10 needs to be terminated prior to an obstruction in the form of a vertical concrete block 20.

The termination 21 consists of first upright 22 and second upright 24, both formed of I-section struts. When viewed in the direction of traffic flow 26, the first upright 22 is before the second upright 24. A bracing structure 28 is provided between the first and second upright 22, 24, and consists of an inclined box section running between the I-section uprights, from a low point at its connection with the first upright 22 to a highest point at its connection with the second upright 24. Other sections such as C- or I-sections could also be used. Given that (as will be explained later) most forces and moments exerted on the termination 21 will be applied via the second upright 24, the inclining of the bracing structure 28 assists in absorbing these forces. Furthermore, the fact that the bracing structure 28 attaches to the first upright 22 at a relatively low height means that the first upright 22 can be relatively short, shorter than the second upright 24. Given that approaching vehicles meet the first upright 22 early, this can improve the impact profile of the termination 21.

A deflector (or "kicker") bar 30 extends from the first upright 22 to the second 24 and beyond. The deflector bar 30 is generally positioned at a level slightly above ground level 18 affixed at the top of the first upright 22. It extends generally alongside the direction of travel 26, past the front of the second upright 24 and in front of the vertical concrete block 20.

In the approach to the termination, and for the deflector bar of the termination structure 21, the rail needs to be somewhat stiffer than is the case for a standard W-section rail. Other locations exist where such stiffening is needed, principally to limit the deflection of the barrier under impact. This is because such barriers generally work by allowing the posts 14 to absorb some energy by shearing off or bending back, releasing the rail 12 to restrain the impacting vehicle. Then, as the vehicle pushes the rail back and slides along it, the vehicle is decelerated by rubbing along the rail and restrained by retaining forces generated by the (then bent) rail.

In any situation, the force which the rail is designed to exert is a balance between the desire to minimise the deceleration imposed on the vehicle, in order to reduce the likelihood of injury to those within it, and the need to restrain the

vehicle from impacting with any obstructions in the immediate vicinity. Where there are no such obstructions, it is generally acceptable to allow the vehicle to deflect the barrier by a significant amount. However, where obstructions exist, it is necessary to limit that deflection in order to prevent a potentially serious impact with the obstruction.

Thus, a range of barrier and rail designs exist in order to satisfy a range of criteria. Figure 1 shows an extreme example, in the form of a vertical concrete block 20 such as a bridge support, close to the carriageway. However, other examples exist, such as signposts or lighting columns placed in a central reservation. At present, these must be given a greater level of protection such as by way of a different rail design or a closer spacing of posts 14.

Where the obstruction is present when the safety barrier is installed, it is straightforward to design the barrier with the obstruction in mind. However, from time to time it is necessary to add an obstruction behind an existing barrier, which must then be modified. Such modifications are difficult to make and can be time-consuming. Also, the use of a different design inherently imposes overheads of itself in terms of stockholding and stock management. An interface between the two systems must be designed, tested and installed.

Figure 1 shows a simplified reinforcement for the W-section rail of which the deflector bar 30 and later sections 32 of the safety barrier 10 are formed. A C-section reinforcement 34 is added behind the W-section, as shown more clearly in figures 2 and 3 which show the W-section rail 40. This may be the main rail 12 of a safety barrier 10 such as shown to the left of figure 1, or a specific part of a larger structure such as the deflector bar 30 of figure 1.

When viewed from a front face 42, the W-section rail 40 has two protruding ridges 44, 46 between which there is a defined valley 48. A C-section reinforcement 34 is disposed behind the W-section rail 40, with the open part of the C-profile receiving the valley 48. Thus, the two edges 50, 52 of the C-section 34 extend into the W-section behind the ridges 44, 46.

This can then be secured to the W-section rail without any further apparatus. Normally, a W-section is secured to posts 14 by a bolt 54 which passes through a slot 56 formed in the valley 48. A corresponding slot at the centre of the C-section 34 can receive the same bolt 54, which will then retain both profiles in place. No welding is (strictly) necessary, allowing galvanised profiles to be used without difficulty.

Figures 4 to 7 show different configurations of rail and reinforcement. In figure 4, the reinforcement is an I-section beam 60 rather than a C-section. An I-section is, of course, a C-section with two additional flanges 62, 64 to the rear, in addition to flanges 66, 68 to the front which correspond to those of a C-section and project into the rear of the corrugations 70, 72 of the W-section rail 40. An I-section reinforcement can be expected to have a greater rigidity as a result of the rear flanges 62, 64 and therefore can be chosen where a greater degree of reinforcement is required.

Figure 5 shows a modified form of rail 80 having a total of three corrugations 82, 84, 86 instead of the two corrugations of the previously-described W-section rails 40. A C-section reinforcement 88 is provided, having upper and lower flanges 90, 92 that are sized to project into the rear of the uppermost and lowermost corrugations 82, 86 respectively. An additional flange could be provided for the middle corrugation 84, or the C-section could be sized to project into a different pattern of corrugations. An easy way to add a central flange for the middle corrugation 84 would be to provide a pair of C-sections, one sized to present a flange into the upper and middle corrugations 82, 84 and one sized to present flanges into the middle and lower corrugations 84, 86.

Figure 6 shows a rail 94 with three corrugations, but formed with rolled angular bends 96 instead of smooth curves as with the rails of figures 1 to 5. A C-section reinforcement 98 fits behind in the manner of figure 5.

Figure 7 shows an arrangement that requires no additional parts above and beyond that used for a known system. A corrugated rail 100 is reinforced with a like rail 102 placed behind it. As the reinforcing rail 102 has protrusions

in the form of its corrugations, these can project into the rear of the corrugations of the frontmost rail 100 thereby supporting it and resisting deformation, to an extent.

Figure 8 shows a further means of re-inforcement, in this example applied to a W-section corrugated rail 104. A pair of circular section tubes 106, 108 fit into the concave regions at the rear of the rail 104, i.e. the area corresponding to the convex sections of the front face of the rail 104. These provide the necessary reinforcement, by a degree that is adjustable through variation of the diameter, thickness and material of the tubes 106, 108.

A short vertical strip 110 could be provided, to connect the tubes at the rear of the rail at locations where the rail is supported by a post 112. This would enable the tubes 106, 108 to be held in place behind the convex regions of the rail 104 without the need for additional fixings, which would also assist in retro-fitting the reinforcement to the rail.

Figure 9 shows the reinforcement of an open box beam rail. These comprise a generally trapezoid section rail 114 oriented such that the smaller parallel face 116 is adjacent the flow of traffic. The larger parallel face 118 of the trapezoid is at the rear of the rail and is largely open at 120. This rail is reinforced by way of a C-section 122 sized to fit within the trapezoid rail 114. Again, the degree of reinforcement is adjustable through variation of the diameter, thickness and material of the C-section 122.

The modifications of figures 4 to 9 can of course be combined. For example, one or more I-section reinforcements as shown in figure 4 could be provided behind the corrugated rails of figures 5 or 6, or in addition to the additional rail of figure 7.

Figures 10 and 11 show how the rail of figure 4, reinforced with an I-section, could be supported. In the view from above shown in figure 10, the upper rear flange 62 and the upper front flange 66 of the I-section reinforcement 60 are visible, although most ot the upper front flange 66 is concealed beneath the upper corrugation 70. At intervals along the I-section

reinforcement 60, the upper and lower rear flanges 62, 64 are rebated to form recesses 122 which provide space for a box section post 124 to be placed behind the central web 126 of the I-section reinforcement 60.

Figure 11 shows that alternative designs of post can still be employed, such as the relatively common Z-section post 128. Other designs such as tubular posts could be substituted.

A further alternative is for only the lower rear flange 64 to be rebated, leaving the upper rear flange 62 intact. Provided that the post 124 or 128 is not too tall, it can fit below the upper rear flange 62.

This means that for a new barrier, the invention offers a straightforward and flexible way of providing a rail with an elevated level of rigidity, while maintaining much commonality of parts. Where new obstructions are being placed behind existing rails, the invention allows the rail to be stiffened quickly and easily. This both makes it more likely that the necessary work will be done at all, and also reduces the time and effort required. This translates into lower labour costs and to a reduction in the time for which traffic flow is disrupted.

It will of course be understood that many variations may be made to the above-described embodiment without departing from the scope of the present invention.

CLAIMS

1. A rail for a vehicle safety barrier, comprising a section at least part of which is convex, behind which is fitted a profile at least part of which fits into the rear of the convex section.

2. A rail according to claim 1 in which the profile has a protrusion which fits into the rear of the convex section.

3. A rail according to claim 2 in which the protrusions comprise horizontally extending flanges.

4. A rail according to claim 3 in which the free ends of the flanges extend into the rear of the corrugations.

5. A rail according to any one of the preceding claims in which the profile is a C-section.

6. A rail according to any one of the preceding claims in which the profile having protrusions is a I-section.

7. A rail according to any one of the preceding claims in which the section is a W-section.

8. A vehicle safety barrier comprising a rail according to any one of the preceding claims.

9. A vehicle safety barrier according to claim 8 in which the rail is secured to a supporting post via at least one fixing that passes through a central part of the corrugated section and the profile.

10. A vehicle safety barrier according to claim 9 in which the profile is not otherwise attached to the corrugated section.

11. A vehicle safety barrier according to claim 9 or claim 10 in which there are a plurality of such posts and fixings, each fixing passing through the corrugated section and the profile.

12. A kit for assembly into a rail for a vehicle safety barrier, comprising a corrugated section and a profile having horizontally extending flanges whose free edges fit into the recesses defined by the rear of the corrugations.

13. A vehicle safety barrier substantially as described herein with reference to and/or as illustrated in the accompanying figures.

The Patent Office

For Innovation

Application No:	GB0611627.1	**Examiner:**	Mr Charles Jarman
Claims searched:	1-13	**Date of search:**	9 October 2006

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	1-12	EP1627956 A1 (SPIG SCHUTZPLANKEN-PRODUKTIONS-GESELLSCAHFT MBH & CO.KG) See whole document.
X	1-12	DE20106675 U1 (SPIG SCHUTZPLANKEN-PRODUKTIONS-GESELLSCAHFT MBH & CO.KG) See whole document.
X	1, 2, 5, 7, 8	DE20017123 U1 (VOEST-ALPINE KREMS FINALTECHNIK GES.M.B.H) See whole document.
X	1, 2, 7, 8	FR2846673 A (POMERO) 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} :

E1G

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

E01F

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

WPI, EPODOC