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(54) Vehicle safety barriers

(57) An end anchor for a vehicle safety barrier comprises a block (28) of material having a front face (30) and a fixing point (38) for a rail (10) at one end thereof, the front face and/or the fixing point being arranged to dispose a rail attached to the fixing point at an angle to the front face. This has the advantage of simplicity in terms of construction and resilience to damage. The angled surface in combination with a rail attached to the fixing point will cause an impacting vehicle to be deflected from its path so as to strike the anchor with a glancing blow, at worst. A vehicle safety barrier is also provided, consisting of an elongate rail, a plurality of supports for the rail, and an end anchor as defined above for supporting an end section of the rail.

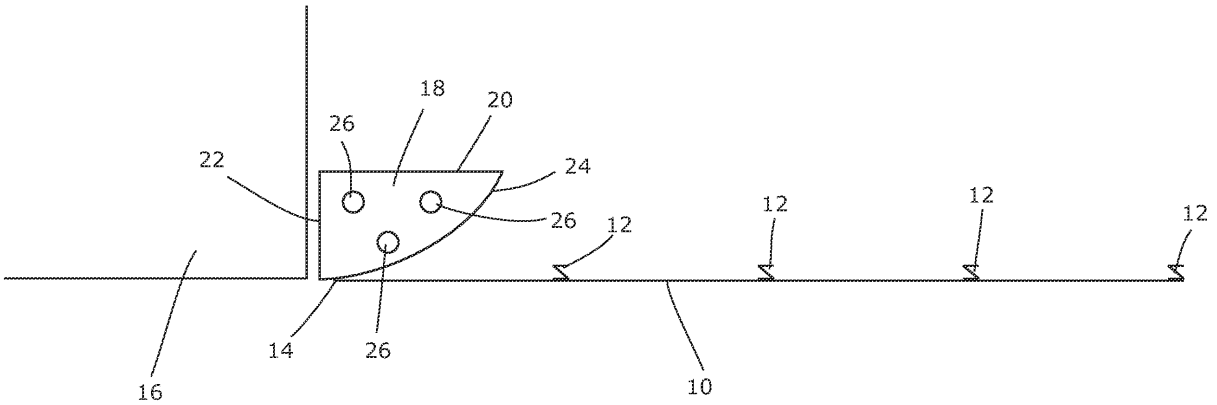

Fig 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to vehicle safety barriers.

BACKGROUND ART

[0002] 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".

[0003] Extensive testing has been carried out in respect of such barriers in order to ensure that under an impact they will redirect the vehicle safely. As a result, such barriers are used routinely 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.

[0004] 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. It is, from time to time, necessary to join different types of barrier, such as where a simple W-section barrier meets a stiffer barrier protecting (for example) a bridge support. These joins must also anchor the W-section barrier, since these operate in tension and therefore require either an effectively infinite length or a firm anchor at the end.

SUMMARY OF THE INVENTION

[0005] We therefore propose an end anchor for a vehicle safety barrier, comprising a block of material having a front face and a fixing point for a rail at one end thereof, the front face and/or the fixing point being arranged to dispose a rail attached to the fixing point at an angle to the front face. This has the advantage of simplicity in terms of construction and resilience to damage. However, the angled presentation of the front face in combination with a rail attached to the fixing point will cause an impacting vehicle to be deflected from its path so as to strike the anchor with a glancing blow, at worst.

[0006] Previous anchor designs have either been very harsh in an impact, or have concentrated on offering a controlled deformation to minimise both the damage to an impacting vehicle and the deceleration imposed thereon. The latter approach results in an anchor that is complex and therefore either relatively expensive, or difficult to install, or both. The present invention departs from this approach and seeks to provide a robust anchor that is sufficiently gentle under impact.

[0007] The material of the anchor can be metallic, concrete, wood, or a polymeric material such as polystyrene. The block can be solid, or it can have internal apertures to reduce the amount of material required and reduce the overall weight of the anchor. Polymeric blocks can be formed in a lattice structure for ease of manufacture.

[0008] The front face is preferably arranged by making at least part thereof arcuate. This allows the front face to curve gently from the fixing point to provide the necessary angled presentation to the traffic flow. Alternatively, the front face could be substantially flat, but at an acute angle to the traffic flow, such as by being at an acute angle to a rear face of the anchor.

[0009] The front face of the anchor can have a lower section and an upper section and a step therebetween, the lower section being at least partly arcuate and protruding beyond the upper section over at least part of its length. This can allow for the lower portion of the front face to act as a deflector for the vehicle, making contact with the suspension structures thereof to push the vehicle away from the anchor with lesser impact on the passenger cell. In this case, the fixing point can be on the upper section, preferably on a region that is level with the lower section.

[0010] The end anchor preferably has a fixing means to secure it to the ground. This can comprise one or more holes (such as two or three) for receiving corresponding posts set in the ground. However, if the anchor is sufficiently heavy then these could be omitted.

[0011] The present invention also provides a vehicle safety barrier, consisting of an elongate rail, a plurality of supports for the rail, and an end anchor as defined above for supporting an end section of the rail.

[0012] The rail is preferably attached to the end anchor once installed. However, they are likely to be supplied separately.

[0013] Once attached, the rail preferably extends alongside the end anchor to the fixing point thereon. This causes an impacting vehicle to be shepherded along the anchor rather than directly towards it, with self-evident benefits. To assist with this, the rail is also preferably fixed to the end anchor at a tangent to an arcuate surface thereof.

[0014] The rail can be a standard a W section, a standard open box beam, or any other rail section.

[0015] A further rail of a different shape to the first rail can continue after the end anchor, so that the anchor defines a joint between different rail section types. In this way, the anchor will provide the necessary longitudinal restraint to the first rail.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] 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 view from above of a first embod-

iment of the present invention;

Figure 2 shows a perspective view of the first embodiment;

Figure 3 shows a perspective view of a second embodiment; and

Figure 4 shows a horizontal cross-sectional view of a third embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] Figure 1 shows the first employment of this invention from above. A standard w-section rail 10 is supported by the plurality of posts 12 along its length prior to the end 14 of the rail 10. In this situation, the rail 10 ends prior to a large concrete structure 16 such as a bridge support. The invention is equally applicable to situations where the w-section rail 10 (or other form of vehicle safety barrier) terminates in favour of a differently-rated rail. Such so-called "transitions" are common at for example the start of bridges where a light gauge safety barrier gives way to a stiffer and stronger barrier intended to restrain vehicles from falling off the bridge. The transition between the two rails represents a particularly hard point in the safety barrier, and vehicles that have impacted the lighter gauge barrier shortly before the transition need to be protected from impact with the end of the heavier gauge barrier.

[0018] As mentioned above, vehicle safety barriers such as those shown in figure 1 tend to operate by shearing (or becoming detached from) the posts 12, at which point the barrier 10 forms an elastic string acting on the side of the vehicle. The rail 10 is pushed back from its original position, and this creates a tension in the barrier which acts on the vehicle so as to return it to the carriageway and restrain its departure. This force, and the retardation caused by running the vehicle along the barrier, serve to prevent excessive departure of the vehicle from the roadway and decelerate it towards a halt. This effect depends on the rail being able to sustain a tensile force, which (in turn) requires the rail either to be of infinite length or to have a firm anchor at its end which is able to absorb those forces.

[0019] Figure 1 shows the end anchor 18 of the first embodiment. This consists of a large concrete block having a planar rear surface 20 and a planar end surface 22 transverse thereto. The planar rear surface 20 is generally parallel to the rail 10 and the planar end surface 22 is generally perpendicular thereto. A curved front surface 24 extends from the front tip of the end surface 22 to the frontmost portion of the planar rear surface 20. The front surface 24 is gently curved so as to give the block a convex shape.

[0020] Three vertical holes 26 are formed in the block 18 to accept three corresponding posts, to fix the block 18 in place. After the block has been positioned, the posts are driven through the holes into the ground to secure the block 18 in place. The rail 10 is then fastened to the front surface 24 of a concrete anchor, near to the corner with the end surface 22 so that, over a short length, the barrier 10 runs alongside the convexly curved surface 24. A car that impacts the rail 10 ahead of the block 18 will therefore deflect the rail 10 backwards, and the tensile force therein will be overcome by the block 18. If the car continues in its trajectory so as to reach the block 18, it will impact the curved front surface 24 and be deflected out of the way of the solid structure 16 in a manner that is gentler than if it had been allowed to impact the structure 16.

[0021] Figure 2 shows a perspective view of the anchor 18, for which it can be seen that the height of the block 18 is a little more than the typical fixing height of the rail 10. It can be seen that the end 14 of the rail 10 is bolted to the block so as to provide the necessary anchor. This can be done by setting a bolt or other threaded member in to block whilst the block is being preformed or cast, or by pre-drilling the block and fitting a threaded insert and then bolting the rail 10 into the threaded insert. The rail 10 can either be bolted directly to the rail as shown, or by way of an intermediate crush structure. If suitable preformed bolt holes are already present in this section of the rail 10 then they can be used, otherwise it will be necessary to drill through the rail 10, paint fresh galvanising coat on the rail, and then bolt the rail to the block 18.

[0022] Figure 3 shows a second embodiment of the present invention in which a block 28 is formed in the same general manner as the block 18 of figures 1 and 2, but has a stepped front surface 30 that is divided in to an upper section 32 and a lower section 34. These are delineated by a step 36, according to which the upper section 32 of the front face 30 is set further back from the lower section 34. This step ends shortly before the fixing point 38 between the rail 10 and the block 28, and thus the fixing point 38 is on a part of the upper section 32 which is level with the lower section 34.

[0023] Nevertheless, behind the fixing point 38, the lower section 30 projects forward of the upper section 32 and thus forms a deflector for an impacting vehicle. This deflector is generally located below the rail 10 and will thus impact the relatively hard suspension and chassis elements of the vehicle, thereby pushing it out of harms way without imposing an excessive deformation on to the passenger cell.

[0024] Figure 4 shows a third embodiment of the present invention in which the block 40 is made of a polymeric material, in this case polystyrene. A lattice pattern is extruded, made up of horizontal, vertical and angled internal members 42 so that the lattice is made up of a large number of triangular shapes, which of course offer the greatest tensile loading capability. Several of these lattice patterns are then assembled into a larger shape as shown in figure 4, connected by adhesives or otherwise. Other polymeric materials might be connected by adhesive, by welding, or by mechanical interconnection.

Generally, the block 40 has the same general external shape as that shown in the first embodiment with a flat rear face 42, a flat end face 44 generally transverse to the rear face 42 and a convexly curving front face 46 that extends from a front corner 48 with the end face 44 to the rear corner 50 with the rear face 42.

[0025] Of course, the item could be extruded as one part, but its size is likely to militate against this. Alternatively, flat sheets of polymeric material could be assembled as necessary.

[0026] The front corner 48 is reinforced with a non-latticed solid section 52 behind it, either by extruding a solid polymeric section or by post-filling the lattice cells with a suitable reinforcement material such as additional polystyrene. This provides the necessary rigidity to the structure so that it can sustain the tensile forces in the barrier during an impact and therefore act as an anchor as required.

[0027] 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. An end anchor for a vehicle safety barrier, comprising a block of material having a front face and a fixing point for a rail at one end thereof, the front face and/or the fixing point being arranged to dispose a rail attached to the fixing point at an angle to the front face.

2. An end anchor according to claim 1 in which the material is concrete.

3. An end anchor according to claim 1 in which the material is polymeric.

4. An end anchor according to claim 3 in which the material is polystyrene.

5. An end anchor according to claim 1 in which the material is metallic.

6. An end anchor according to claim 1 in which the material is wood.

7. An end anchor according to any one of the preceding claims in which the front face is so arranged in that at least part thereof is arcuate.

8. An end anchor according to any one of the preceding claims in which the front face is so arranged in that at least part thereof is substantially flat and at an acute angle to a rear face of the anchor.

9. An end anchor according to any one of the preceding claims in which the block is solid.

10. An end anchor according to any one of the preceding claims in which the front face has a lower section and an upper section and a step therebetween, the lower section being at least partly arcuate and protruding beyond the upper section over at least part of its length.

11. An end anchor according to claim 10 in which the fixing point is on the upper section.

12. An end anchor according to claim 10 or claim 11 in which the lower section protruding beyond the upper section over a part of its length only, and fixing point is located on the upper section in a region that is level with the lower section.

13. An end anchor according to any one of the preceding claims having a fixing means to secure it to the ground.

14. An end anchor according to claim 13 in which the fixing means is at least one hole for receiving a post set in the ground.

15. An end anchor according to claim 14 in which there are two or three holes.

16. An end anchor according to claim 13 or claim 14 in which the at least one hole is substantially upright.

17. A vehicle safety barrier, consisting of an elongate rail, a plurality of supports for the rail, and an end anchor according to any one of the preceding claims for supporting an end section of the rail.

18. A vehicle safety barrier according to claim 17 in which the rail is attached to the end anchor.

19. A vehicle safety barrier according to claim 18 in which the rail extends alongside the end anchor to the fixing point thereon.

20. A vehicle safety barrier according to any one of claims 17 to 19 in which the rail has a W section.

21. A vehicle safety barrier according to any one of claims 17 to 19 in which the rail is a beam.

22. A vehicle safety barrier according to claim 21 in which the rail is an open box beam.

23. A vehicle safety barrier according to any one of claims 17 to 20 in which the rail is fixed to the end anchor at a tangent to an arcuate surface thereof.

24. A vehicle safety barrier according to any one of claims 17 to 23 in which a further rail continues after the end anchor, the further rail being of a different

shape to the rail.

25. An end anchor substantially as any one described herein with reference to and/or as illustrated in the accompanying figures.

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

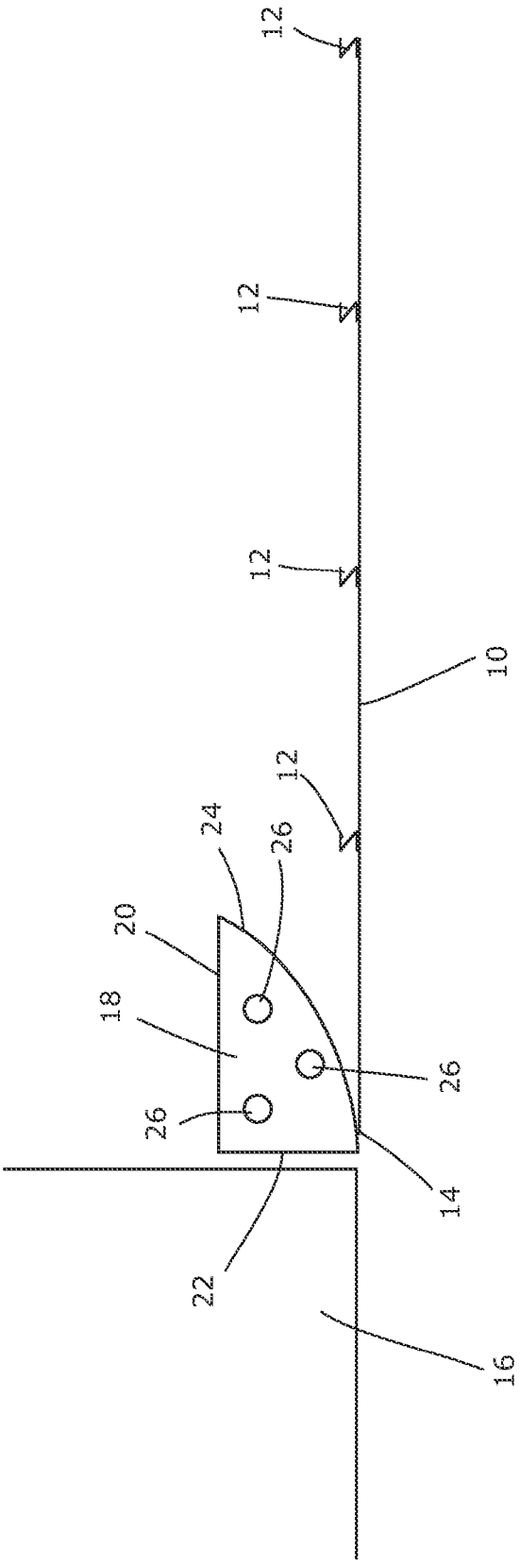

Fig 1

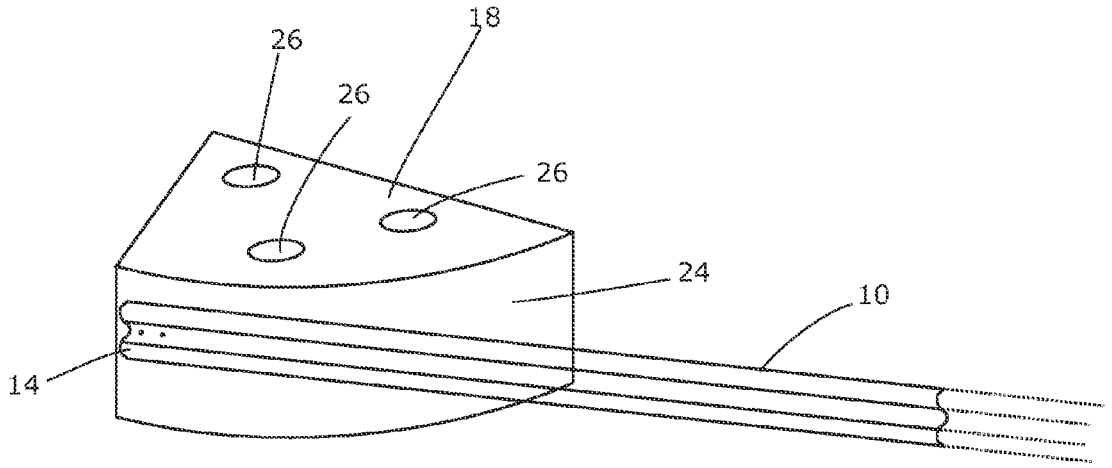

Fig 2

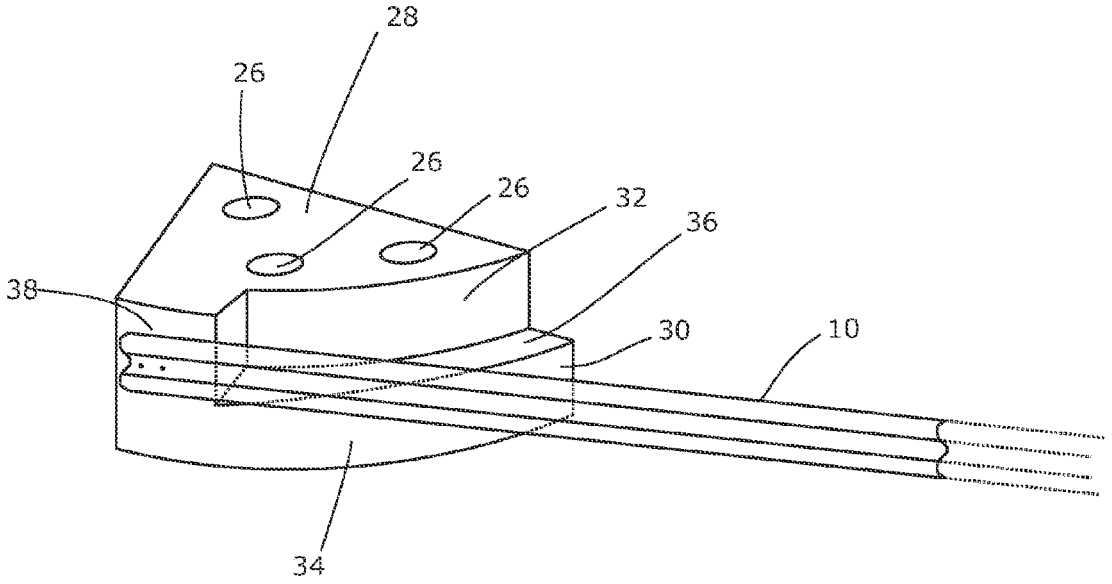

Fig 3

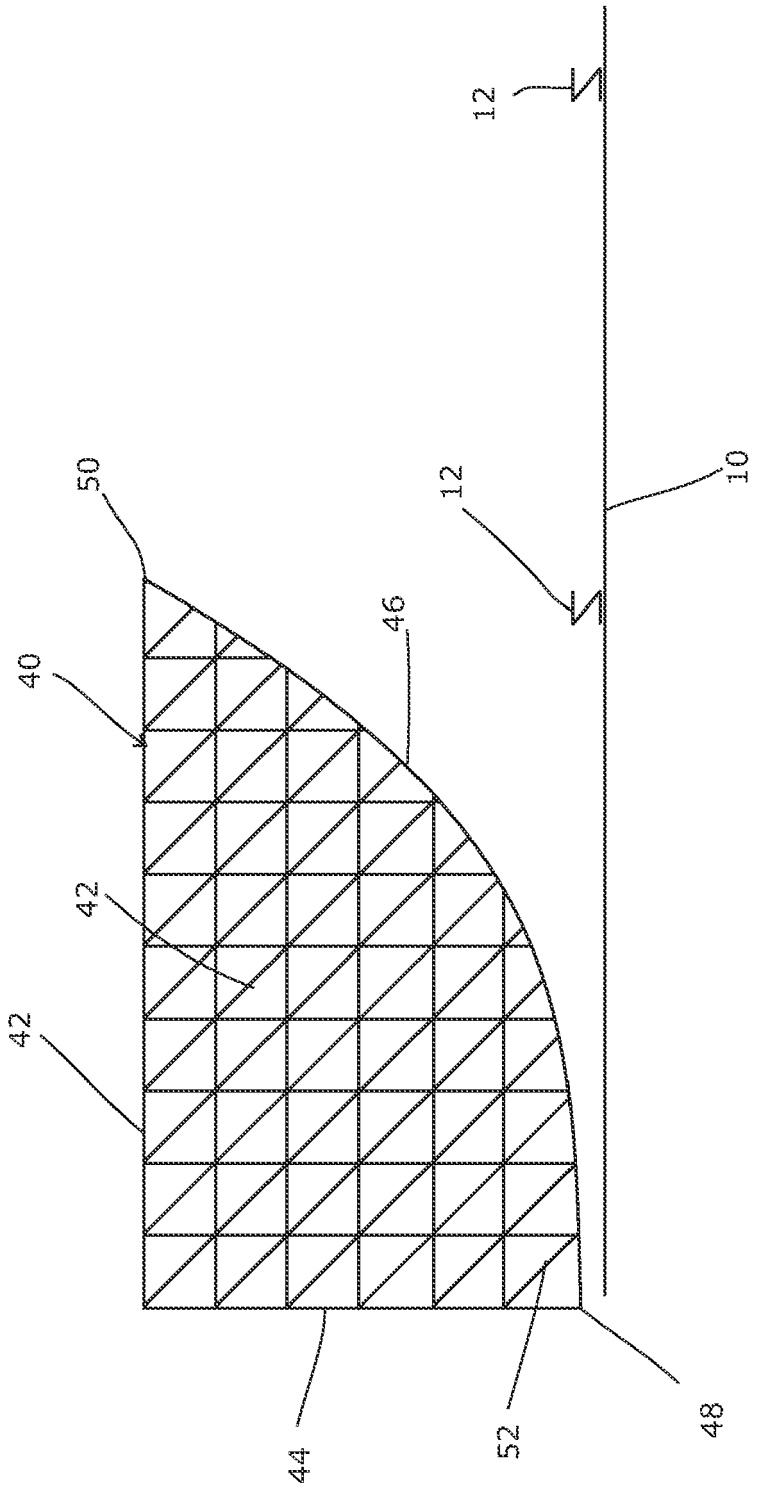

Fig 4

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PARTIAL EUROPEAN SEARCH REPORT

which under Rule 63 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number EP 07 12 1026

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	DE 37 42 356 A1 (SPS SCHUTZPLANKEN GMBH [DE]) 29 June 1989 (1989-06-29) * the whole document *	1,2, 8-12, 17-20	
X	US 2004/262588 A1 (BRONSTAD MAURICE E [US]) 30 December 2004 (2004-12-30) * paragraphs [0113], [0116]; figures 15A,15B *	1,2,8,9, 17-20	
X	US 2 004 026 A (RILEY WOOTEN GEORGE) 4 June 1935 (1935-06-04) * page 1, right-hand column, lines 47-55; figures 8,9 *	1,2,8,9, 17-19,21	
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INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

1

Place of search	Date of completion of the search	Examiner
Munich	17 March 2008	Flores Hokkanen, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04E07)

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PARTIAL EUROPEAN SEARCH REPORT

Application Number
EP 07 12 1026

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	US 1 452 875 A (HEALY GEORGE E) 24 April 1923 (1923-04-24) * page 1, lines 65-95; figures 1-6 * -----	1,17	
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EPO FORM 1503 03.82 (P04C10)

European Patent Office

INCOMPLETE SEARCH
SHEET C

Application Number
EP 07 12 1026

Claim(s) not searched:
25,26

Reason for the limitation of the search:

The claims define an end anchor resp. a vehicle safety barrier with such an end anchor with reference to and/or as illustrated in the figures, implying an indefinite number of combinations and possibilities, for which no meaninglful search is possible,

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 12 1026

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-03-2008

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82