



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.05.2008 Bulletin 2008/19

(51) Int Cl.:
E01F 15/02^(2006.01) E01F 15/04^(2006.01)

(21) Application number: **07380104.5**

(22) Date of filing: **13.04.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(72) Inventor: **Amengual Pericas, Antonio**
33470 Corvera
Asturias (ES)

(74) Representative: **Hernán-Carrillo Portolés, Santiago**
Fortuny 7
28010 Madrid (ES)

(30) Priority: **31.10.2006 ES 200602775**

(71) Applicant: **Hierros y Aplanaciones, S.A. (HIASA)**
33470 Corvera,
Asturias (ES)

(54) **Improved system for contention of lateral vehicle impact, with a high capacity of contention and of energy absorption**

(57) Improved system for contention of lateral vehicle impact with a high capacity of contention and of energy absorption, characterized by comprising a vertical post (2) that has a fold or acute dihedral angle (15) placed at a given height in such a manner that its lower segment is vertical and its upper segment, which is an extension of the lower segment, is tilted towards the front, advancing the rail forward towards traffic, and also characterized by having a continuous horizontal non-stressed tie (4) to prevent the post (2) from being released from the system in case of impact, and because it incorporates, between the lower rail (1) and the post (2), an spacer-shock absorbing element (3) comprising a rigid part (19) and a deformable part (20), all of it intended to attain a high capacity to absorb the energy resulting from a vehicle colliding against it, to redirect the vehicle, to decrease the deceleration levels, to gain control over the vehicle during and after impact, and also to decrease the possibility of non-desired post-impact reactions of the vehicle, as well as endowing the system with a high capacity to control the dissipation of the absorbed energy and with a certain ability to deform similarly after each impact of a vehicle.

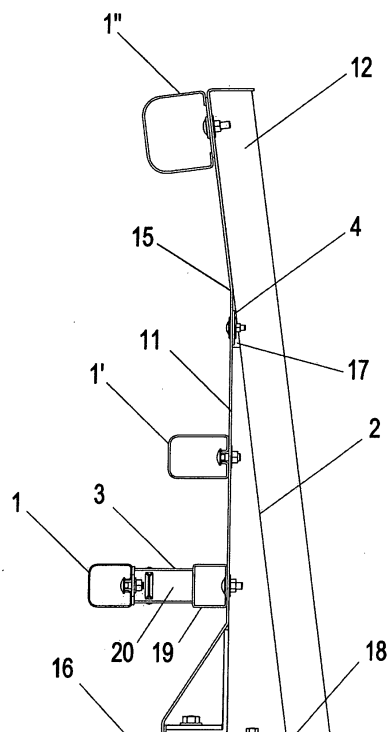


FIG.3

Description

OBJECT OF THE INVENTION

[0001] The present invention refers to a series of improvements added to the main patent of invention P 200401947 that referred in turn to a System for Lateral Contention of Vehicle Impact, with a High Capacity of Contention and energy absorption applicable as a road safety measure such as the safety barriers and side rails, that are used at the edges and median strips of roads.

STATE OF THE ART

[0002] The main patent of invention P 200401947 claims a system of contention of lateral vehicle impact having a high capacity of contention and energy absorption that is constituted by a post of the kind having a leg, a frontal plate and a base plate and in which said post is affixed to the terrain at regular intervals, and the system is constituted by one or more system of continuous horizontal rails arranged longitudinally and secured to the post by means of inner clamps placed inside the rails, and also constituted by a spacing element that is characterized in that the leg of the post comprises or is configured by two tubular profiles that face each other and are preferably welded together, and to the frontal plate of the post, and in which preferably one of them is "U" shaped having its wings spread open in the vicinity of the frontal plate of the post and the other having a trapezoidal "C" section with its axis placed covertically and slightly tilted toward the area of vehicle impact and having its wings spread and affixed to the "U" shaped profile, and having in its rear face one or several mutually parallel ribs along the same plane, parallel to the longitudinal axis of the profile and along its entire length, and where the section of the "C" shaped profile is kept constant along its entire length and the other tubular profile with the "U" shaped section decreases said section along its length and along its height, in such a manner that the wings reach their longest length at the lower base, which is bigger than the upper base, where the wings are shorter.

[0003] The base plate of the post has frontal orifices, preferably four, mutually parallel and rear-side orifices, preferably two, mutually parallel and all of them transversally elongated, that is, perpendicular to the barrier, and contained in the same horizontal plane and perpendicular to the barrier. All said holes are crossed through by anchoring bolts that serve to affix the base plate of the post to the anchoring plate while leaving certain clearance to allow a relative transversal movement between the base plate of the post and the anchoring bolts. Additionally, over the base plate there is a positioning template or form that serves to fix the post and positioning it in place when is first assembled and allows for some controlled movement of the leg that enables it to move away sufficiently so as to not break upon impact. This flat bar or strap comprises a wing set at a 90° angle that has in its base

one or more elongated openings, preferably having a rectangular shape through which bolts can be driven to affix the structure to the anchoring plate, and having one or more little arms or prongs, preferably two that withstand the impact of the vehicle by bending and allowing for the controlled and sufficient displacement so the structure does not to break upon impact.

[0004] The inner clamps that serve to affix the rails to the post have square openings through which spherical or round-headed screws or bolts with square stems will be pressure driven. These openings will be made, preferably, in such a manner that the side walls of each square window opening exert pressure on the side faces of the square stem of the screw or bolt that is secured with the corresponding nut and washer through the post.

[0005] In the system described in patent P 200401947 the spacing element placed between the post and the rail is a high capacity shock absorbing set capable of absorbing high energy and that comprises one or several hollow tubular elements having, preferably, a square or rectangular section of equal length, which axis are preferably oriented horizontally and perpendicular to the system, preferably with the horizontal axis of their bases aligned and placed approximately at the same height that the horizontal axis that runs through the middle of the rail, with said hollow tubular element or elements affixed to their corresponding flat bar or to the inner or external part, preferably to both, of their corresponding "U", "C" or "sigma" shaped profiles, that are preferably opened, to serve as common base, and are also provided with affixing elements to secure them to other third elements, the whole set up arranged as a sandwich and in turn secured in its entirety between the vertical support element that also serves as affixing element, or post, and to the shock absorbing element or rail. The flat bar has openings - "windows"- that are preferably square or rectangularly shaped that match the inner part of each of the hollow tubular elements, an arrangement that allows access, through the hollow internal part of the tubular elements, to the point where the shock absorber is joined to the post through the other flat bar, that has several holes of preferably square section drilled into it. The hollow tubular elements have on the surface notches or slots having triangular, trapezoidal or semicircular section, that are preferably mutually parallel and positioned perpendicular to the axis of the tubular element, facing the inner or outer side, or in an alternating sequence, in order to facilitate and guide the folding of the hollow tubular element in case of it sustaining an impact from a vehicle and thus to lessen the effects of said impact on the vehicle itself.

[0006] The section of the hollow tubular elements is, preferably, square, rectangular or circular and said elements are arranged between the vertical support element that also serves as affixing element or post and the horizontal impact sustaining element or rail, with the centers of their respective axis preferably aligned, although they can also be placed in the same manner but non-aligned,

with rotated on their own axis.

[0007] The system described in patent P 200401947 has a safety cable system to keep the post joined to one or several of the rails. This safety cable system has two grommets in each end with coupling sleeves or sockets to secure and tighten it, that serve to join, preferably, the upper clamp and the post, in such a manner that the cable is fixed to the post through one of the grommets that fits over and through a bolt, having preferably an spherical or rounded head with its corresponding nut and washer, and into the oval holes, with the major axis running vertically, that has been placed in the flat side of the post. The affixing to the clamp is done with the grommet at the other end, that is also formed by a coupling sleeve and washer, in such a manner that the grommet fits over and through the bolt, nut and washer, and the cylindrical socket with conical head is introduced through the oval hole of the clamp, that has its major axis running horizontally precisely so that the socket can be inserted in that sense and then when rotated it abuts against the walls of the oval hole and the washer acts as abutting end, securing the socket firmly in place.

[0008] On the other hand, the frontal plate of the post, and consequently, also in the wings of the "U" shaped profile of the leg of the post that are affixed to it, and at the level of the first, or lower, rail, is tapered, preferably forming a trapezoidal shape, that serves to house the shock absorbing kit, while also serving to reduce the distance between the lower rail and the other rails, and the vertical of the post, and therefore, the space made available to contain the deformation of the shock absorber.

DESCRIPTION OF THE INVENTION

[0009] The present invention refers to an addition made to the main patent of invention mentioned in the previous section. It details improvements made to the aforementioned system to contain lateral impacts of moving vehicles and having a high contention and shock absorbing capacity, or high energy absorption capacity that has the following characteristics:

- A new post in the barrier. This new feature is considered as an essential element of improvement in the design in that its frontal side or face (the one facing the traffic and that is parallel to the system) has two vertical sections. The first vertical section (or slightly tilted towards the area of impact) arising from the base of the post or from the nose of the base of the post up to a certain height;
- And a second section - immediately following the first- that forms an acute dihedral angle facing the traffic, that is, having a slight tilt towards the front that brings the upper part or head of the post slightly towards the lane where vehicles circulate. This arrangement provides a better impact control for rigid and articulated trucks. The upper part that is tilted towards traffic allows the upper rail to be positioned

ahead or before the lower rails (except for the lower rail that is intended to receive the impact of light vehicles. When a heavier vehicle impacts it, the wheels of said vehicles roll over it, otherwise it moves towards the post upon deformation of the spacing element without offering resistance to the impacting vehicle) in such a manner that the first rigid impact of both the lateral chassis of the truck's cabin in the first contact against the system, and the truck's bed in the second contact or whiplash, occurs against the upper rail before the lower rails, designed to contain the aggressive impact of the front wheel of the truck, are impacted. This sequence allows taking control of the vehicle and redirecting it before the vehicle impacts the essential part of the system, while also allowing to control the contact and guide the vehicle through surfaces that ensure a better traction, stability and transmission of deformations and forces, such as are the vertical flat surface of the lower part of the truck's bed or trailer or the flat side of the body of the tractor head and the frontal face of the upper rail. This forward facing arrangement also serves to prevent to a large extent events such as the elements or parts of the truck that are below the height of the platform to become abruptly hooked to the lower rails and the posts of the barrier (such as the oil sump, fuel tanks, etc.)

- A shock absorbing spacer element placed horizontally and perpendicular to the system and composed, by two consecutive parts or areas that are well differentiated by their behavior, either rigid or deformable, when impacted by a light vehicle or passenger car, that are called respectively Rigid part and Deformable part. The Deformable part comprises the shock absorber-spacer element described in patent P 200401947 and the Rigid part, that functions as a rigid element in the manner of a distancing element, comprises a rigid metal profile, preferably tubular, which section can be either square or rectangularly shaped. The rigid part is joined, rigidly, to the deformable part on one side and on the other is directly joined to the post or the rail and the deformable part, rigidly joined to the rigid part on one side and on the other, and through a plate or a profile to the rail or the post respectively. The tubular elements of the Deformable part deforms axially by collapsing when impacted by a light vehicle, while the tubular element of the Rigid part remains without practically any deformation at all during the impact of the light vehicle, staying between the rail and the post once the tubular elements of the Deformable part have collapsed. Since the center of gravity of the light or passenger vehicle is higher than the set comprised by the lower rail and the spacer element, the reaction of the Rigid part during impact causes the vehicle to oscillate slightly or to gyrate around the horizontal rotation axis that is parallel to the system, more or less controlled, once the Deformable part has collapsed a

slight oscillation in the vehicle. This slight oscillatory movement lessens the effect of the impact of the frontal pillar of the side of the passenger car that sustains the impact, that is the pillar that joins the lateral chassis to the roof of the car, against the rail located above the lower rail, making it less aggressive than if the vehicle was fully supported by all four wheels, without oscillation or swinging. It must be taken into account that when there is no deformable spacing element placed between a rail and the post, the contact between the light vehicle against said rail is very rigid and causes strong deceleration peaks. That is the reason of having included a deformable spacing element between the lower rail and the post, although it is not possible to do the same between the upper rails because, although such action would improve the contact against the light vehicle, it would severely diminish the retention capacity of the frontal wheel of the heavy vehicle, making the rail less stable and resistant during deformation.

- A continuous, non-stressed, longitudinal horizontal tie having a flat or slightly curved section serving as a strap or flange plate, that can be located either at the front and adhered to the frontal face of the post or behind the frontal face, and preferably adhered to it, and fully going through the successive posts of the system by passing through a hole drilled into the post to that effect. This non-stressed tying element ensures that in the event of a very aggressive impact that may break the fixed points that join the posts to the rails, and also break the points where the post has been anchored to the ground (i.e., such as at a bridge platform), the post remains secured by at least the tie, and thus avoid the situation where it can be wrenched from the fixed anchoring or securing points and be forcefully ejected. Since the flat or slightly curved tie is not a rigid element and, having a small moment of inertia, it easily deforms elastically, or otherwise bends or buckles, does not tend to break in the same manner than the elements of fixed joining points (where the means of union are usually bolts and nuts) that are more rigid, and once the forces sustained overcome the limits of resistance of the points of joining, they break, releasing the elements thus joined together. The rails transmit, rigidly, a significant amount of the forces they receive during impact against a heavy vehicle to the points where they are joined to the post, and therefore, said joints are susceptible to break and release the post. The non-stressed flat or slightly curved tie, on the contrary, deforms easily and hardly transmits forces to the points by which it is joined to the post. The tie is not horizontal stressed, and therefore it does not receive forces before the rails are released from the post or break, which ensures that if the elements joining the rails to the post and the post to the anchoring plate do break, the posts would continue to be linked together by the tie and would not be completely re-

leased or separated from the system, provided that some posts have not been released from their anchoring points.

5 DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1. Shows the anterior side view facing the direction of traffic of a segment of the system showing several rails, the tie and the posts.

Figure 2. Shows the posterior side view facing in the opposite direction of the flow of traffic the direction of traffic of a segment of the system showing several rails, the tie and the posts.

Figure 3. Shows a Straight Segment of the system in the post.

Figure 4a. Perspective view of the spacer-shock absorber that shows the tubes, the plate and the system used to secure the parts to the posts and rail, with the deformable part adjacent to the rail.

Figure 4b. Perspective view of the spacer-shock absorber that shows the tubes, the plate and the system used to secure parts to the posts and rail, with the deformable part adjacent to the post.

Figure 5a. Perspective view of the tie that shows how it is secured to the post, and shows the tie going behind the frontal face of the post and adhered to it.

Figure 5b. Perspective view of the tie that shows how it is secured to the post, and shows the tie before the rear face of the post and adhered to it.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

[0011] According to all of the above, the improvements added to the main patent of invention P 200401947 are characterized by comprising the following:

[0012] A post (2), one or several levels of rails (1) (1') (1''), a spacer- shock absorber element (3) and a tie element(4).

[0013] The post (2) is preferably configured by a frontal plate (11), a base plate (18) and a leg or posterior support (12) that in turn may be configured by one or more elements that, due to how they are conceived and arranged, absorb and transmit well the traction and bending forces, and their sveltness serves to attain a smaller working width (this width results from adding to the greater transversal deformation of the system during the vehicle impact the width of the system itself), which is considered as a favorable circumstance in what regards impacts, since the forces are transmitted from the upper part to

the lower part, or in other words, the loads are better transmitted to the base (18) and from the base to the ground (16) to which the post is anchored, resulting in a highly efficacious elastoplastic behavior.

[0014] The post (2) is configured in such a manner that the frontal face or frontal plate (11) of the post (2) forms an acute dihedral angle or fold (15) at certain height, preferably at mid-height, oriented towards the side facing traffic, so as to divide the face or frontal plate (11) of the posts into two segments, a lower vertical segment that is slightly tilted towards the area of impact, and the other an upper tilted segment continuous to the previous segment. The first lower segment arises either from the base (18) or from the nose of the base, and is vertical up to the height of the fold (15) and, from that point on and until it reaches the upper segment or top of the post (2), the second segment or upper segment of the frontal face (11) forms an acute angle (15) with the vertical plane causing the frontal face (11) to be closer to the traffic side as the tilt angle increases to the head of the post, which is then the point closer to the traffic (2).

[0015] The leg, or element over which the post is assembled (12) of the post (2) is configured in a manner coherent with the presence of the fold or dihedral angle (15) of the frontal face or plate (11) of the post, said leg (12) may itself comprise one or several assembled parts in such a manner that in case of it being made in one piece, said sole piece must adopt the same fold or acute dihedral angle (15) as the frontal face (11), where said frontal face may be a solidary part of the leg or support (12) and, if the leg or support (12) comprises two or more parts, the whole of it must adapt to the arrangement and placement of the frontal plate (11) in what pertains to the position of the dihedral angle (15) at a certain height.

[0016] The spacer- shock absorber element (3) is placed, in the manner of the filling of a sandwich, between one external and independent horizontal element intended to receive impacts, such as the rail or profile, preferably the lower one (1), and another external and independent vertical element intended to serve as support and retention, such as the post (2).

[0017] The spacer- shock absorber element (3) comprises, in the horizontal direction that is perpendicular to the system, by two differentiated parts: the rigid part (19) and the deformable part (20). The rigid part (19) comprises a metal element or profile bar, preferably tubular and hollow (7) having its longitudinal horizontal axis parallel to the system, and having, preferably, a square or rectangular section, with one of its vertical faces resting completely on the frontal face or plate (11) of the post (2), and to that effect, said face of the tubular element (7) has had holes (9) drilled on its surface to provide a through passage for the screw that will secure it to the frontal face (11) of the post (2) and having the other vertical face, opposing the previous face, solidly joined to the tubular elements (5) that comprise the deformable part (20). The deformable part (20) is comprised by one or several hollow metal tubular elements (5) having the same length.

The section of the hollow metal tubular elements (5) is, preferably, square, rectangular or circular and the elements are arranged with their axis mutually parallel, perpendicular to the system and having their upper and lower faces parallel to the horizontal plane, showing on said faces notches or taperings (8) preferably oriented towards the outside, the inside or alternating the outside and inside orientations on the tubular element, and joined together by their anterior part, preferably by a metal plate or flat rectangular bar (6), or by a metal profile shaped as a "U", "C" or "sigma", or by a hollow metal tubular profile with drill holes (10) on its surface that will serve as through passages for the screw that will bolt it to the rail (1), and the tubular elements (5) are joined together by its anterior part by means of a lateral vertical face of the metal element that is preferably tubular (7) and is the rigid part (19) of the spacer-shock absorber element (3), to which these elements are solidly affixed, preferably by having welded them.

[0018] The mechanical properties of the hollow metal elements, preferably tubular (7) that comprise the rigid part, and the hollow metal tubular elements (5) of the deformable part comprising the spacer- shock absorber element (3), relative to the wall thickness or relative to their mechanical resistance, are considerably different, and therefore their behavior before a given force is also different. The wall of the tubular elements (5) of the deformable part (20) is thinner and/or is configured by a material having less resistance than the hollow element, preferably tubular (7) that comprises the rigid part (19), and therefore, when a light or passenger vehicle impacts against the rail (1) the rail transmits the forces sustained to the spacer- shock absorber element (3) and the hollow tubular elements (5) of the deformable part (20) fold over themselves and collapse, and the metal rigid element, preferably tubular (7) of the rigid part (19) stays without having deformed at all, or very slightly, so in essence it works as a distancing element.

[0019] In this manner, the spacer- shock absorber element (3) is then configured by a rigid element that is preferably tubular and hollow (7), one or several metal tubular deformable or collapsible elements (5) provided with notches (8) and a metal plate or flat bar (6) that is preferably rectangular.

[0020] In an alternative embodiment, the spacer-shock absorber element (3) can be configured in the system, according to the direction perpendicular to the system in a manner opposite as the one described above, by alternating the rigid parts (19) and the deformable parts (20) (see Figure 4a), so the metal plate or flat bar (6) of the deformable part (20) is actually the part affixed to and completely supported by the vertical post (2) and one of the side faces of the metal rigid element, preferably tubular and hollow (7) of the rigid part (19) will be affixed to the horizontal rail (1) (see Figure 4b). When a light vehicle or passenger car impacts the system, the tubular elements (5) of the deformable part (20) act as absorption pivots, adding a greater area of absorption to the con-

tention system as well as adding greater capacity to channel and distribute the energy absorbed by the structure of the absorbing element (3). During impact, the tubular elements (5) of the deformable part (20) of the spacer-shock absorber element (3) fold exactly by the notches or taperings (8), like an accordion, endowing the contention system with a certain capacity of deforming in a similar manner with each impact of a vehicle, and thus avoiding unforeseen behaviors, and facilitating the function of redirectioning the vehicle, while also lengthening the life of the remaining elements that comprise the contention system. The rigid element, preferably tubular and hollow (7) of the rigid part (19) remains undeformed or only slightly deformed during the impact of a light vehicle.

[0021] During impacts involving a heavy vehicle, in addition to the collapsible system comprising the tubular elements (5) of the deformable part (20) of the spacer-shock absorber element (3), folding like an accordion, the other phenomenon that occurs is that the rigid element, preferably tubular and hollow (7) of the rigid part (19) of the spacer-shock absorber element (3), is totally or partially crushed in a rhomboidal or parallelogram shape, depending if the section of the tubular element (7) is respectively square or rectangular. In case of impact against a heavy vehicle, both parts of the spacer element (the rigid and the deformable part) may be deformed and collapse.

[0022] In order to avoid that during impact against a heavy vehicle the post (2) may be severed from the system and ejected if the points anchoring it to the terrain (16) and to all the rails (1) (1') (1''), are cut as a result of all the forces transmitted by the heavy vehicle to the system, a continuous, non-stressed horizontal tie (4) has been incorporated. This tie (4) is shaped as a strip or flange plate having a section, preferably constant, flat or slightly curved and affixed to the frontal face or plate (11) of the post (2) preferably by nuts and bolts (13) that pass through successive holes (14) made to that effect on the surface of the frontal face or plate (11) of the post and through the corresponding holes (21) made on the tie or strap (4). The tie (4) can be placed behind the frontal face or plate (11) of the post, in direct, or very near contact to it by making the tie (4) go through completely through a hole or hollow (17) at the leg or support structure (12) of the post, made to that precise effect (see Figure 3 and Figure 5a). The tie (4) can also be placed from the frontal side and be in direct contact with the frontal face or plate (11) of the post (see Figure 5b).

[0023] If the severity of the impact of a heavy vehicle is above certain level of kinetic energy, as determined by the mass of the vehicle and the speed and angularity of the collision, since the post (2) transmits rigidly part of the forces caused by the collision to the elements that anchor the system to the ground or substrate (16) located at the base (18) of the post and the rails (1) (1') (1'') also transmit rigidly part of said forces to the elements that join them together and to the post, and both joining elements, those joining the post to the anchoring plate and

those joining the post to the rails may fall or break apart. In this case, and since the tie (4) is not stressed and its section module is very small, since is a flat, or only very slightly curved strap, the tie (4) does deform easily, buckling or holding, but without transmitting rigidly the forces sustained to the joining elements (13) securing the tie (4) to the frontal plate (11) of the post (2), and therefore these joining elements (13) do not break, and the posts (2) remain attached to the system by said ties (4), even when the joining elements of rails and anchoring have given out and been released. In this manner, knowing that the impact from a heavy vehicle may break the anchoring joints of only a specific number of posts, the posts that are released are still secured to the tie (4) and this tie (4) is secured to the terrain (16) by the posts that have not been released.

Claims

- 1. Improvements added to patent of invention N° 200401947 by the "System for contention of lateral vehicle impact, with a high capacity of contention and of energy absorption", characterized in that** the post has a fold or acute dihedral angle placed at a certain height, preferably below the upper rail, configuring then the post in two segments, one that is the extension of the other and having a lower section, vertical or slightly tilted towards the side of impact, that goes from the base, or from the nose of the base of the post towards the fold, and an upper section that forms an acute angle with the vertical line oriented towards the traffic side and is the extension of the previous vertical segment, in such a manner that the top of the rails are closer to the traffic than the bottom, and the upper rail is placed ahead of the rest, closer to the traffic, except for the lower rail that is not intended for containing the impact of a heavy vehicle.
- 2. Improvements added to patent of invention N° 200401947 by the "System for contention of lateral vehicle impact, with a high capacity of contention and of energy absorption", according to the first claim, characterized in that** spacer-shock absorber element placed between the post and the rail incorporates a rigid element to act as a distancing element before the force originated when impacted by a light vehicle. This element is located between the deformable structure, or the spacer-shock absorbing element and the rail or the post, comprising a rigid metal profile, and both parts, the rigid part and the deformable part, placed one after the other in the horizontal direction perpendicular to the system and solidarily joined together by suitable joining means, and the set comprised by both parts joined on one side to the rail and on the other to the post.

3. **Improvements added to patent of invention N° 200401947 by the "System for contention of lateral vehicle impact, with a high capacity of contention and of energy absorption"**, according to the previous claims, that is **characterized in that** the rigid element of the spacer- shock absorber element comprises a rigid bar or metal profile, preferably tubular and hollow, having its horizontal axis placed parallel to the system, and having a section preferably square or rectangular, that has holes on one of its vertical faces to serve as through passages for it to be affixed to either the rail, directly or through an inner clamp, or to the frontal face of the post by joining means, preferably by bolts in such a manner that the opposite vertical face is solidarily joined to the deformable part of the spacer- shock absorber element, preferably by welding.
4. **Improvements added to patent of invention N° 200401947 by the "System for contention of lateral vehicle impact, with a high capacity of contention and of energy absorption"**, that according to the previous claims is **characterized in that** it incorporates a continuous horizontal tie, preferably non-stressed, and having a section preferably constant, flange or slightly curved in the manner of a strap or flange plate that joins the posts together, and that is affixed to the frontal face or plate of the post, going behind said frontal face and preferably in direct or very close contact with it, in such a manner that it goes through the successive posts of the system by passing through the holes or hollows drilled to that effect on the posts so it can be affixed to the frontal face of the post by preferably bolting.
5. **Improvements added to patent of invention N° 200401947 by the "System for contention of lateral vehicle impact, with a high capacity of contention and of energy absorption"**, that according to the previous claims is **characterized in that** the horizontal continuous tie can additionally be affixed to the frontal face or plate of the post, preferably at a medium height before said frontal face and also preferably adhered to it without going through the posts by means of joining elements, preferably bolting.

50

55

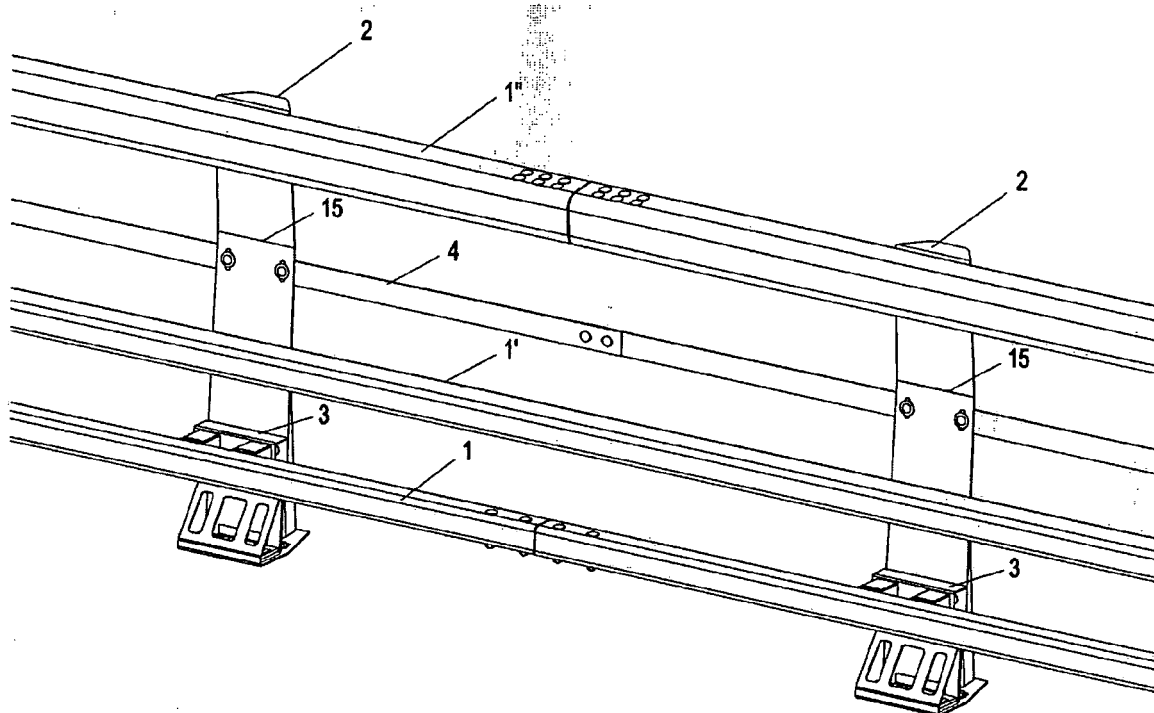


FIG.1

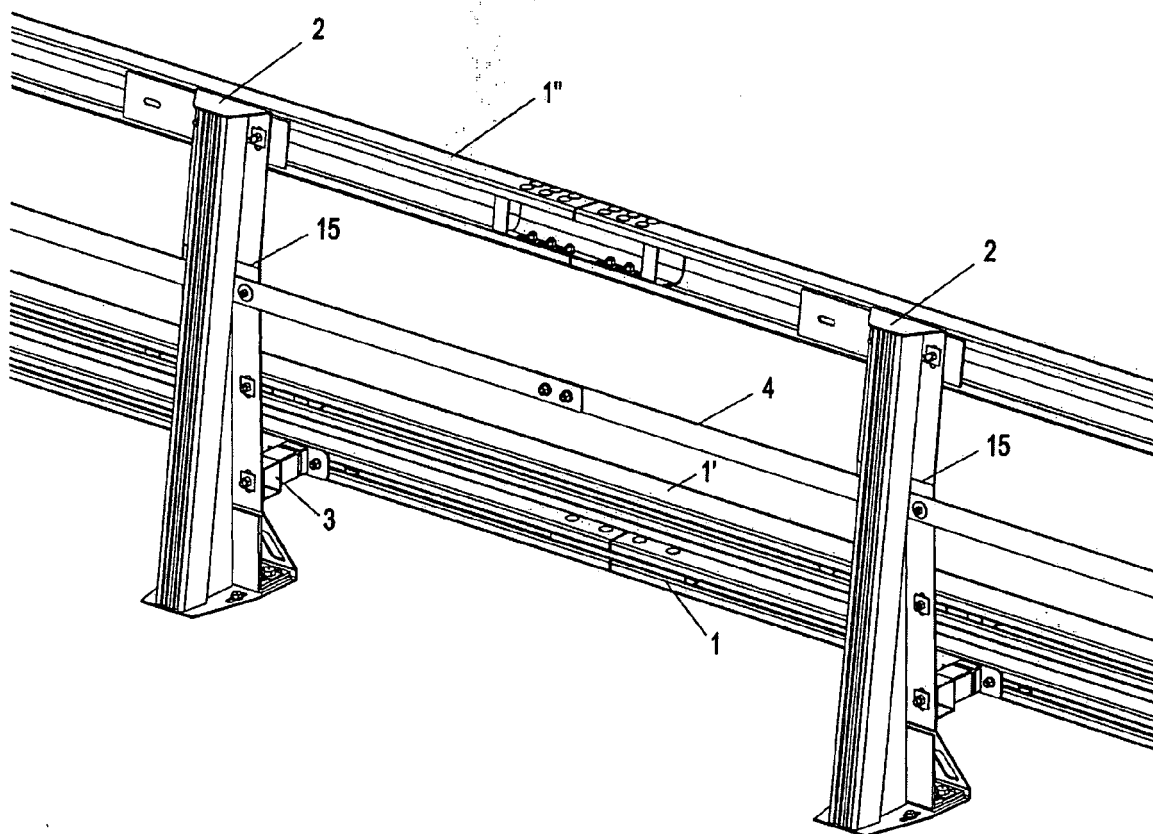


FIG.2

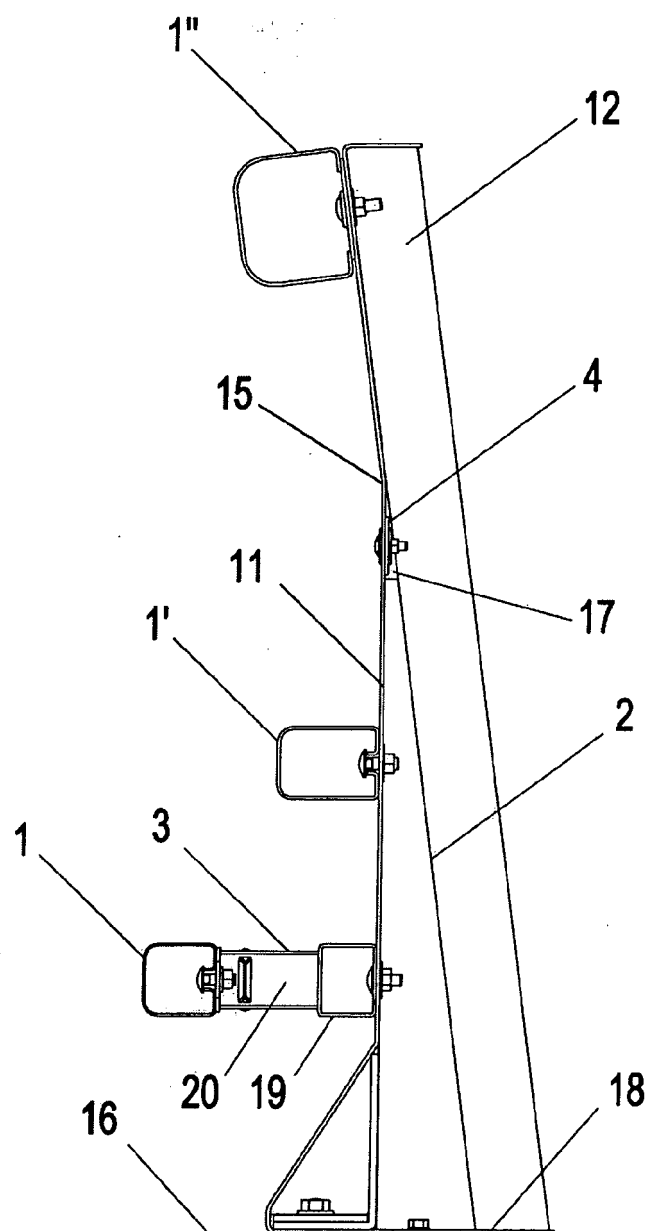
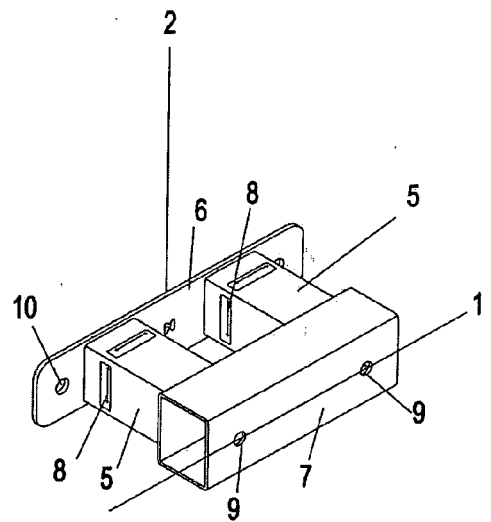
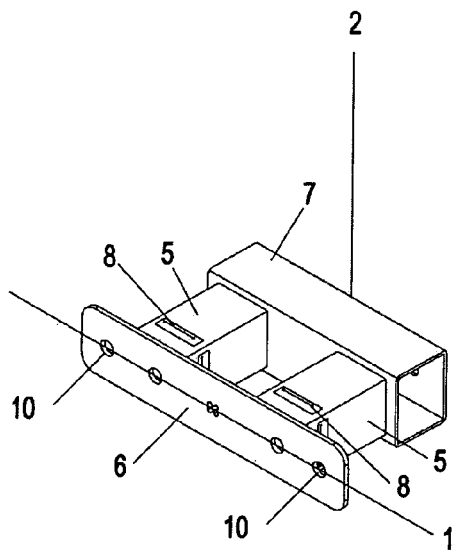


FIG.3



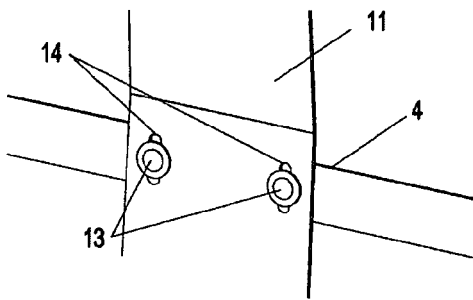


FIG. 5a

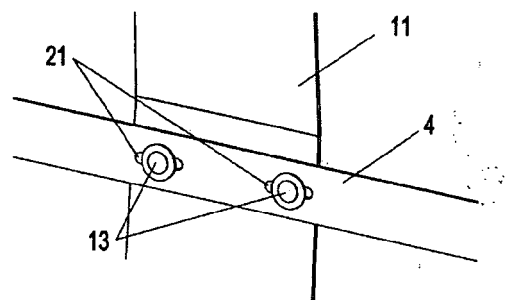


FIG. 5b



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 38 0104

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 566 486 A (PROFIL R [FR]) 24 August 2005 (2005-08-24) * figure 2 *	1,4,5	INV. E01F15/02 E01F15/04
X	US 6 595 715 B1 (CORTELL DOMINICK J [US]) 22 July 2003 (2003-07-22) * figures 1,3,8,11 *	1,4,5	
A	EP 1 693 518 A (SPIG SCHUTZPLANKEN PROD GMBH [DE]) 23 August 2006 (2006-08-23) * figure 13 *	2,3	
A	DE 103 26 414 B3 (SPIG SCHUTZPLANKEN PROD GMBH [DE]) 26 August 2004 (2004-08-26) * figure 7 *	2	
D,A	EP 1 624 111 A (HIERROS Y APLANACIONES S A HIA [ES]) 8 February 2006 (2006-02-08) * abstract; figures 1-5 *	1	
A	JP 2001 234515 A (NIPPON LIGHT METAL CO) 31 August 2001 (2001-08-31) * figures 1,2 *	1	TECHNICAL FIELDS SEARCHED (IPC)
			E01F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 January 2008	Examiner Tran, Kim-Lien
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			

4

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 38 0104

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-01-2008

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 1566486	A	24-08-2005	FR	2866662 A1	26-08-2005
US 6595715	B1	22-07-2003	NONE		
EP 1693518	A	23-08-2006	NONE		
DE 10326414	B3	26-08-2004	EP	1486615 A1	15-12-2004
EP 1624111	A	08-02-2006	ES	2220238 A1	01-12-2004
			ES	2270740 A1	01-04-2007
			WO	2006027394 A1	16-03-2006
JP 2001234515	A	31-08-2001	JP	3700521 B2	28-09-2005

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO P200401947 A [0001]