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(54) **Road barrier**

(57) A road barrier (1) comprising a number of supporting posts (2) which are fixed to the ground in upright position along the side edge of the carriageway, a longitudinal containment strip (4) which is transversally fixed onto the supporting posts (2) so as to extend along the side edge of the carriageway, at a predetermined height from the ground, and fixing means (5, 6, 7) adapted to rigidly connect the longitudinal containment strip (4) to each supporting post (2); said fixing means (5, 6, 7) comprise at least one preset break-off pass-through bolt (6, 7) which, in turn, comprises a pass-through screw (10) which has the threaded stem (11) inserted in pass-through manner across two adjacent structural elements (2, 3, 5) of the road barrier (1), one of which is selectively either the supporting post (2) or the longitudinal containment strip (4), and is provided on said threaded stem (11) with a transversal notch (11a) which locally reduces the nominal cross-section of the threaded stem (11) by a value ranging between 10% and 90%, so as to form a preferential rupture point of the stem.

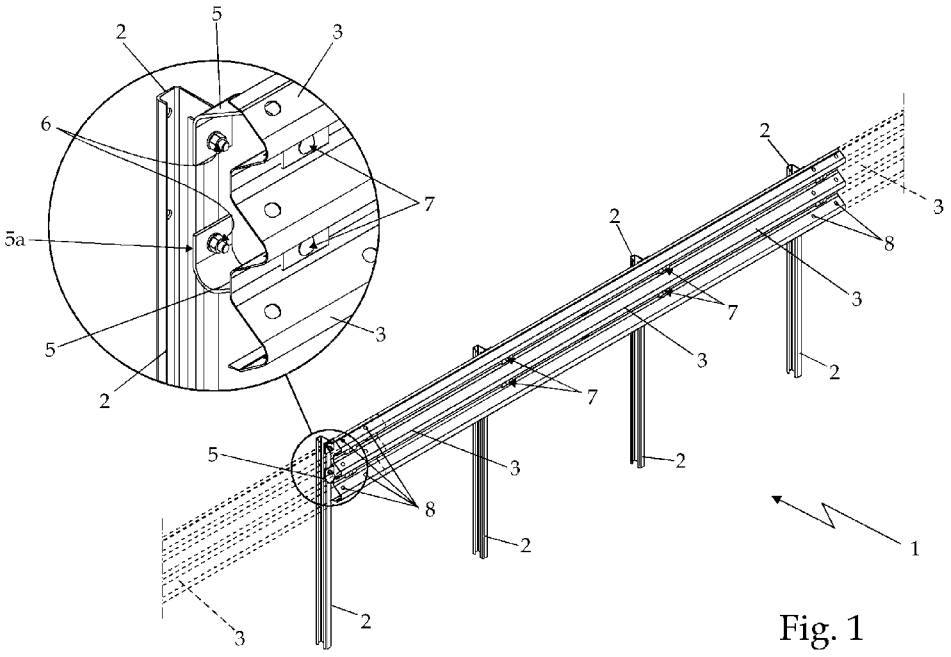

Fig. 1

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Description

[0001] The present invention relates to a road barrier.

[0002] More in detail, the present invention relates to a metal road barrier of the "separation" type, to which the following description refers purely by way of example without this implying any loss of generality.

[0003] As is known, the currently most common, metal road barriers, commonly known as guard-rails, consist of a number of supporting poles fixed into the ground in a substantially vertical position, one after the other along the side edge of the carriageway, and by a number of longitudinal containment members which are fixed on the supporting posts in horizontal position after one another, at a predetermined height from the ground, and are additionally butt-fixed by means of specific pass-through bolts, so as to form a longitudinal containment strip which seamlessly extends along the side edge of the carriageway.

[0004] More in detail, the single longitudinal containment members are usually fixed to the corresponding supporting posts by the interposition of specific programmed-deformation spacer elements which, in turn, are rigidly fixed to the supporting posts by means of the pass-through bolts of known type.

[0005] In order to guarantee a suitable absorption capacity of the kinetic energy of the vehicle, and at the same time to prevent the climbing over the barrier, the "separation" road barriers are structured so that the longitudinal containment strip may separate in programmed and selective manner from the supporting posts which are knocked over by the vehicle which violently impacts against the road barrier, and may then remain suspended at a sufficient height from the ground to rest on the body of the vehicle and prevent it from climbing over the barrier.

[0006] Unfortunately, the separation of the longitudinal containment strip from the supporting posts is greatly conditioned by the shape of the through-slots which are engaged by the pass-through bolts which restrain the spacer elements to the supporting posts, and by the position of the head of the pass-through bolt in the corresponding slot, and therefore the longitudinal containment strip may separate prematurely from the supporting posts, thus worsening the performance of the road barrier.

[0007] Aim of the present invention is to make the dynamic behavior of a "separation" road barrier as constant and close as possible to that established during the step of designing, without this significantly increasing the road barrier production and installation costs.

[0008] In compliance with these aims, according to the present invention there is provided a road barrier as defined in claim 1 and preferably, though not necessarily, in any one of the dependent claims.

[0009] The present invention will now be described with reference to the accompanying drawings, which show a non-limitative embodiment thereof, in which:

- Figure 1 is a perspective view of a road barrier realized according to the teachings of the present invention, with parts in section and parts removed for clarity;
- Figure 2 is an exploded perspective view of a portion of the road barrier shown in figure 1;
- Figure 3 shows a detail of the Figure 1 road barrier on enlarged scale and with parts removed for clarity; whereas
- Figure 4 shows on enlarged scale an axonometric view of the pass-through locking bolt shown in Figure 3.

[0010] With reference to figures 1, 2 and 3, reference numeral 1 indicates as a whole a metal road barrier specifically structured to be installed along the side edge of the road with the function of absorbing the kinetic energy of the vehicle which could impact against the road barrier, at the same time preventing the vehicle from climbing over the road barrier.

[0011] The road barrier 1 essentially comprises a number of vertical supporting posts 2, which are fixed to the ground in erect, i.e. substantially vertical, position at a predetermined distance from one another along the side edge of the carriageway; and a number of longitudinal containment members 3 which are transversally fixed to the vertical supporting posts 2, in approximately horizontal position and at a predetermined and substantially constant height from the ground, so as to be locally parallel to the ground and aligned to one another.

[0012] The containment longitudinal members 3 are additionally butt-fixed to one another in rigid and substantially irremovable manner, so as to form a longitudinal containment strip 4 which extends without interruptions along the side edge of the carriageway at a predetermined height from the ground.

[0013] More in detail, in the example shown, the horizontal longitudinal containment members 3 are fixed to the vertical supporting posts 2 by the interposition of specific spacer elements 5, preferably of the programmed-deformation type, each of which is fixed to the side of the corresponding vertical supporting post 2 at a predetermined height from the ground and overhangingly extends towards the middle of the carriageway remaining locally, substantially parallel to the ground.

[0014] In other words, each spacer element 5 is fixed on the side edge of the corresponding supporting post 2 rigidly and substantially irremovably by means of a first number of pass-through locking bolts 6, and the horizontal longitudinal containment member 3 is fixed onto the distal end of the spacer element 5 by means of a second number of pass-through locking bolts 7.

[0015] With reference to figures 1 and 2, in the example shown, in particular, each vertical supporting post 2 consists of a rectilinear metallic bar of predetermined length, which preferably, though not necessarily, has a C, U, T, or double T cross-section and has the lower end 2a structured so as to be stuck/driven directly into the ground, or

structured so as to be rigidly fixed onto a lower base (not shown) which, in turn, is anchored to the ground by means of foundation bolts of known type.

[0016] The longitudinal containment members 3 are instead preferably made of substantially rectilinear metallic section-bars 3 preferably, though not necessarily, with double or triple wave cross-section, which have a length such as to connect to each other a plurality of adjacent vertical supporting poles 2 (four supporting posts in the example shown), are superimposed to one another on each other at two ends, and are fixed in rigid and irremovable manner to one another by means of a plurality of pass-through anchoring bolts 8 which engage in pass-through manner the body of two consecutive metallic section-bars 3 at the reciprocal superimposition area.

[0017] With reference to figures 1 and 2, each programmed-deformation spacer element 5 is instead preferably, though not necessarily, formed by a substantially U- or C-folded, flat metallic strip 5 which has the two distal ends 5a L-folded one towards the another, and is preferably adapted to be fixed to the vertical supporting post 2 with the two distal ends 5a resting on the side panel of the supporting post 2.

[0018] With reference to figures 2, 3 and 4, unlike the traditional pass-through bolts for road barriers, the pass-through bolts 6 which are adapted to rigidly fix the spacer element 5 to the vertical supporting post 2, are preset break-off, pass-through bolts 6 and each of them comprises:

- a metal pass-through screw 10 which has the threaded stem 11 inserted in pass-through manner in the body of the vertical supporting post 2 and the spacer element 5, and is provided, on the threaded stem 11, with a transversal notch 11a, which is adapted to locally reduce the nominal cross-section of the threaded stem 11 to a value comprised between 10% and 90%, so as to make a preferable rupture point of the stem; and
- at least one metal nut 12 which is screwed onto the threaded stem 11 so as to maintain the spacer element 5 stably abutting against the vertical supporting post 2.

[0019] More in detail, the transversal notch 11a is dimensioned so as to locally reduce the nominal cross-section of the threaded stem 11 by a value preferably comprised between 15% and 50% of the nominal cross-section of the stem.

[0020] In the example shown, in particular, the pass-through screw 10 of each preset break-off, pass-through bolt 6 is also provided with a head 13, and the threaded stem 11 engages in pass-through manner reciprocally aligned specific circular pass-through holes, which are made one in the body of the vertical supporting post 2 and the other in the spacer element 5, so as to arrange the head 13 of the screw in abutment either on the supporting post 2 or on the spacer element 5. The nut 12 is thus screwed onto the threaded stem 11 so as to maintain the spacer element 5 stably in abutment against the vertical supporting post 2, and the vertical supporting post 2 in abutment against the head 13 of the screw.

[0021] Preferably, each preset break-off pass-through bolt 6 additionally comprises two spacer washers 14, which are fitted onto the threaded stem 11 on opposite sides of the vertical supporting post 2 and of the spacer element 5, respectively next to nut 12 and the head 13 of the screw.

[0022] With reference to figure 3, the transversal notch 11a is additionally made on the threaded stem 11 of the pass-through screw 10 of each preset break-off pass-through bolt 6 so as to be locally substantially aligned with the interface area between the vertical supporting post 2 and the spacer element 5 (i.e. aligned with the contact surface between the vertical supporting post 2 and the spacer element 5) when the pass-through bolt 6 rigidly locks the spacer element 5 onto the vertical supporting post 2.

[0023] With reference to figures 3 and 4, in the example shown, in particular, the transversal notch 11a of the threaded stem 11 preferably consists of an annular groove 11a which extends on the threaded stem 11 so as to lay on a reference plane locally substantially perpendicular to the longitudinal axis L of the stem, and is shaped so as to locally reduce the nominal cross-section of the threaded stem 11 by a value preferably ranging between 15% and 30%, and preferably, though not necessarily substantially equal to approximately 20-25% of the nominal cross-section of the threaded stem 11.

[0024] More in detail, in the example shown, the threaded stem 11 preferably has a nominal diameter equal to approximately 13,546 mm (millimeters), and the transversal notch 11a, i.e. the annular groove 11a, is shaped so as to locally reduce the nominal cross-section of the threaded stem 11 by a value preferably equal to approximately 19% of the cross-section of the stem, or preferably equal to approximately 26% of the nominal cross-section of the stem.

[0025] Finally, in the example shown, cross-section of the annular groove 11a preferably, though not necessarily has the shape of a substantially isosceles trapezoid converging towards the centre of the stem.

[0026] Operation of the road barrier 1 can be easily inferred from the description above and does not require particular explanations, except to specify that, due to the particular structure of the threaded stem 11 of the pass-through bolts 6, the longitudinal containment strip 4 separates from the vertical supporting posts 2 exclusively as a result of the preset break-off of the threaded stems 11 at the transversal notch 11a.

[0027] This fact makes the separation of the longitudinal containment strip 4 from the vertical supporting posts 2 always timely and coherent with the design specifications of the road barrier.

[0028] The advantages offered by the road barrier 1 are noticeable. The preset break-off at the transversal notches 11a made on the stems 11 of the screws 10 of the pass-through bolts 6 which anchor the spacer element 5 to the vertical supporting post 2 prevents the dynamic behavior of the road barrier in case of impact of a vehicle from unforeseeable differing from that defined during the step of designing of the barrier.

[0029] It is finally apparent that changes and variants can be made to the road barrier 1 described and shown herein without departing from the scope of the present invention.

[0030] For example, in a different embodiment, the pass-through locking bolts 6 are normal pass-through bolts for road barriers, while the pass-through bolts 7 which are adapted to rigidly fix the horizontal longitudinal containment members 3 to the spacer elements 5, are preset break-off, pass-through bolts 7 which differ from the preset break-off, pass-through bolts previously described in that the transversal notch 11a is made on the threaded stem 11 of the pass-through screw 10 so as to be locally substantially aligned with the interface area between the spacer stem 5 and the horizontal longitudinal containment member 3 (i.e. aligned with the contact surface between the spacer element 5 and the horizontal longitudinal containment member 3) when the pass-through bolt 7 rigidly locks the horizontal longitudinal containment member 3 onto the spacer element 5.

[0031] In this case, obviously, the nut 12 is screwed onto the threaded stem 11 so as to maintain the horizontal longitudinal containment member 3 stably in abutment against the spacer element 5.

[0032] Again in a less sophisticated embodiment, the road barrier 1 is free from the programmed-deformation spacer elements 5, and the horizontal longitudinal containment members 3 are fixed directly onto the side of the vertical supporting posts 2 by means of the preset break-off pass-through bolts 6.

[0033] Obviously, in this embodiment, the transversal notch 11a is made on the threaded stem 11 of the pass-through screw 10 of each locking pass-through bolt 6 so as to be locally substantially aligned with the interface area between the supporting post 2 and the horizontal longitudinal containment member 3 (i.e. aligned with the contact surface between the vertical supporting post and the horizontal longitudinal containment member 3) when the pass-through bolt 6 locks the horizontal containment longitudinal member 3 rigidly on the vertical supporting post 2.

Claims

1. Road barrier (1) comprising a number of supporting posts (2) which are fixed to the ground in upright position along the side edge of the carriageway, a longitudinal containment strip (4) which is transversally fixed onto the supporting posts (2) so as to extend along the side edge of the carriageway, at a predetermined height from the ground, and fixing means (5, 6, 7) adapted to rigidly connect the longitudinal containment strip (4) to each supporting post (2); the road barrier (1) being **characterized in that** said fixing means (5, 6, 7) comprise at least one preset break-off pass-through bolt (6, 7) which, in turn, comprises a pass-through screw (10) which:

   - has the threaded stem (11) inserted in pass-through manner across two adjacent structural elements (2, 3, 5) of the road barrier (1), one of which is either the supporting post (2) or the longitudinal containment strip (4), and
   - is provided on said threaded stem (11) with a transversal notch (11a) which locally reduces the nominal cross-section of the threaded stem (11) by a value ranging between 10% and 90%, so as to form a preferential rupture point of the stem.

2. Road barrier according to Claim 1, **characterized in that** the transversal notch (11a) is dimensioned so as to locally reduce the nominal cross-section of the threaded stem (11) by a value ranging between 15% and 50% of the nominal cross-section of the stem.

3. Road barrier according to any one of the preceding claims, **characterized in that** the transversal notch (11a) is made on the threaded stem (11) of the pass-through screw (10) so as to be substantially aligned with the interface area (i) between said two adjacent structural elements (2, 3, 5) of the road barrier (1).

4. Road barrier according to Claim 1, 2 or 3, **characterized in that** the first structural element of the road barrier (1) is the longitudinal containment strip (4), and **in that** the second structural element of the road barrier (1) is the supporting post (2).

5. Road barrier according to Claim 1, 2 or 3, **characterized in that** the fixing means (5, 6, 7) also comprise a spacer element (5) interposed between the longitudinal containment strip (4) and the supporting post (2), and **in that** the first structural element of the road barrier (1) is said spacer element (5).

6. Road barrier according to Claim 5, **characterized in that** said spacer element (5) is a programmed-deformation spacer element.

7. Road barrier according to any one of the preceding claims, **characterized in that** the transversal notch (11a) on the threaded stem (11) consists of an annular groove (11a) which extends on the threaded stem (11) so as to lay on a reference plane locally substantially perpendicular to the longitudinal axis (L) of the stem.

8. Road barrier according to Claim 7, **characterized in that** the annular groove (11a) is dimensioned so as to locally reduce the nominal cross-section of the threaded stem (11) by a value ranging between 15% and 30%.

9. Road barrier according to Claim 7 or 8, **characterized in that** the cross-section of the annular groove (1a) has the shape of a substantially isosceles trapezoid converging towards the centre of the stem.

10. Road barrier according to any one of the preceding claims, **characterized in that** said preset break-off pass-through bolt (6, 7) further comprises a nut (12) which is screwed onto the threaded stem (11) so as to maintain the two adjacent structural elements (2, 3, 5) of the road barrier (1) stably abutting one against the other.

11. Road barrier according to any one of the preceding claims, **characterized in that** the longitudinal containment strip (4) comprises a sequence of horizontal longitudinal members (3) which are transversally fixed to the supporting posts (2), in an approximately horizontal position and at a substantially constant height from the ground, so as to be locally and substantially parallel to the ground and aligned one after the other, and are finally butt-fixed one to the other in a rigid and substantially irremovable manner.

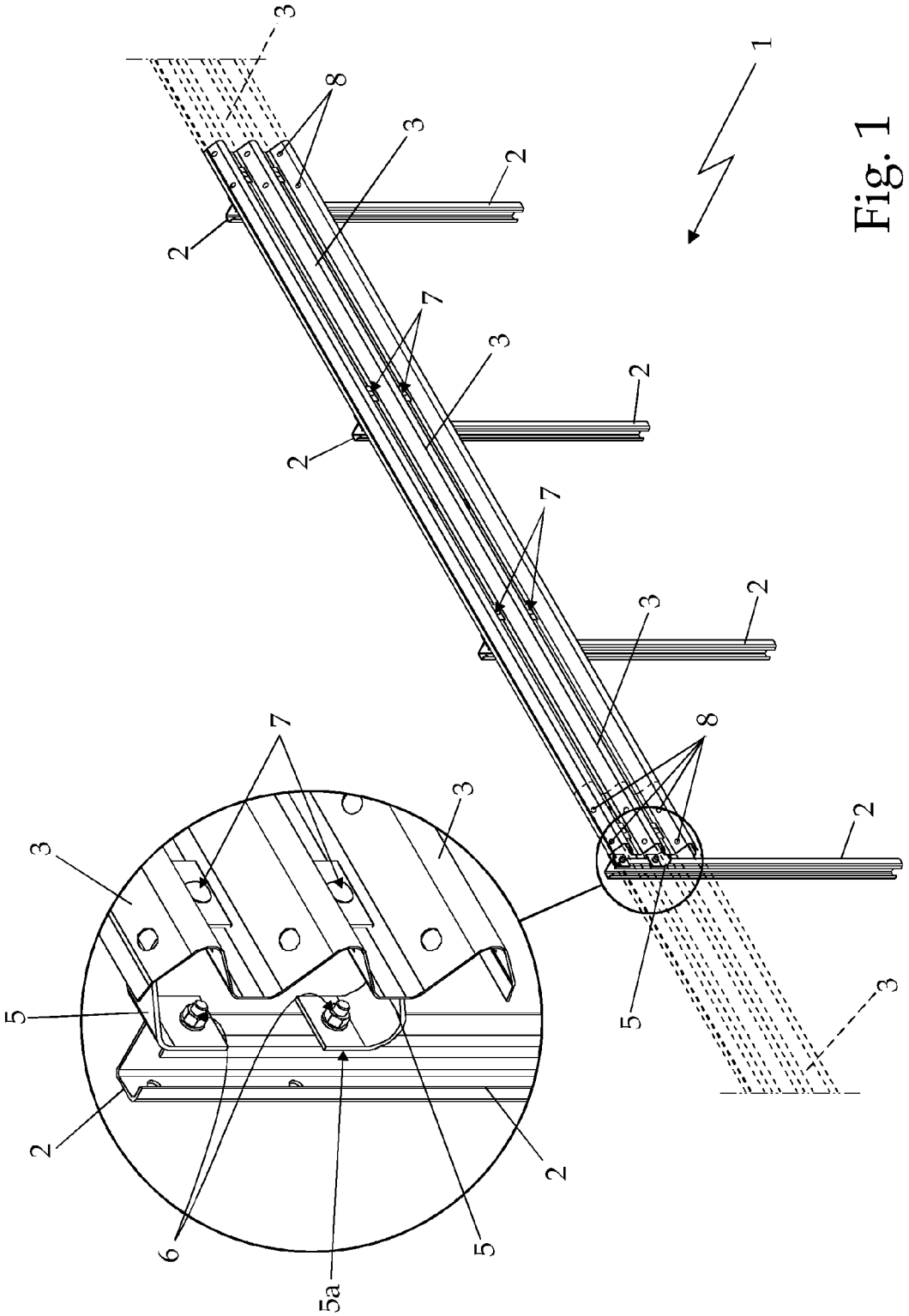

Fig. 1

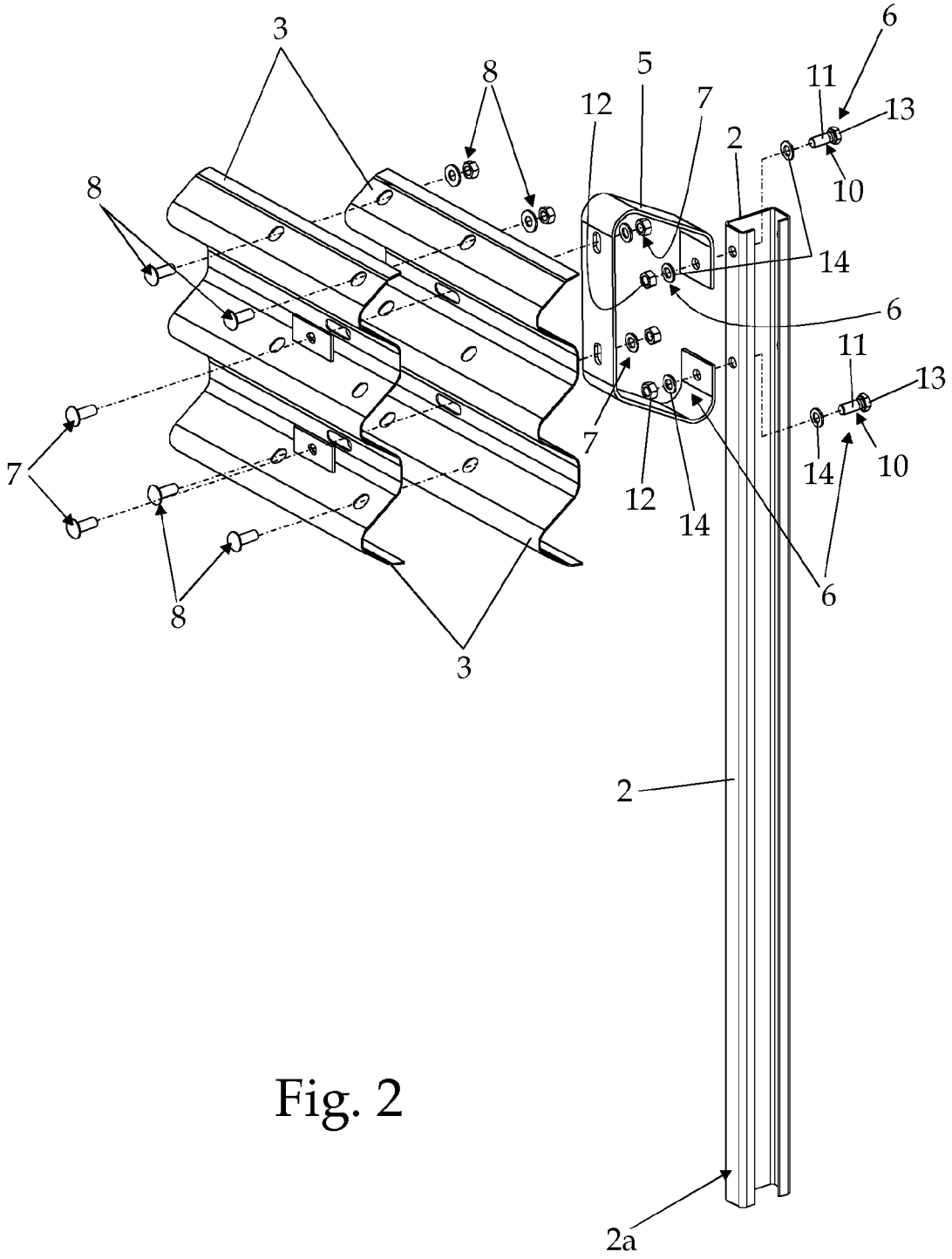

Fig. 2

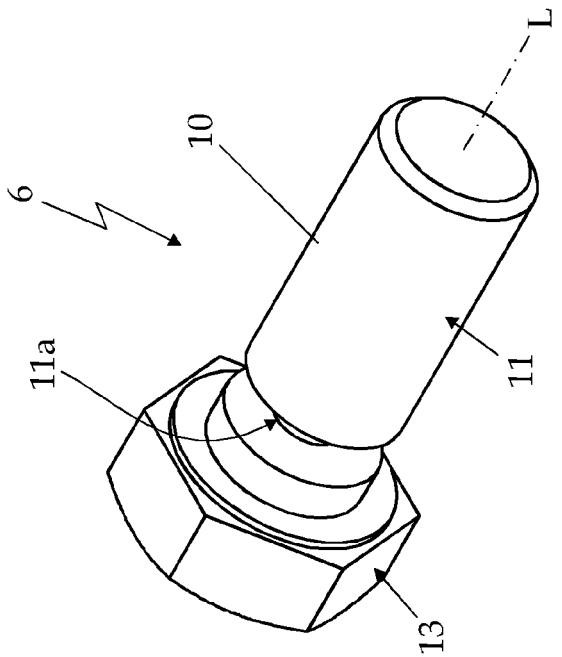

Fig. 4

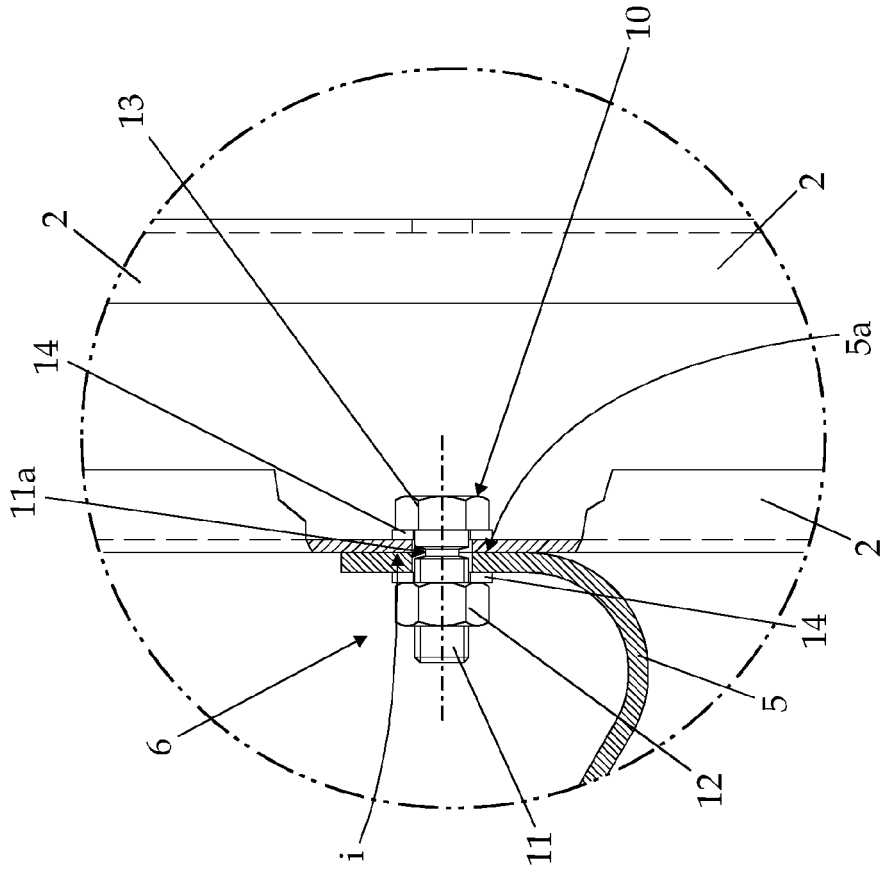

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 12 18 9334

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 2 128 342 A2 (HIERROS Y APLANACIONES S A HIA [ES] HIERROS Y APLANACIONES S A HIASA) 2 December 2009 (2009-12-02) * the whole document * -----	1-11	INV. E01F15/04
X	US 2008/083914 A1 (OCHOA CARLOS M [US]) 10 April 2008 (2008-04-10) * figures 1,1E,3C * * paragraphs [0007], [0009], [0069] - [0079], [0115] * * figures 1, 2, 3 * -----	1,3,4,7, 10,11	
A	DE 86 10 402 U1 (URLBERGER, HERMANN HANS [DE]) 12 June 1986 (1986-06-12) * page 1, lines 8 - 11 * * page 4, lines 11 - 17 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 February 2013	Kremsler, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 18 9334

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01-02-2013

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