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(54) **Anchor terminal for safety lines**

(57) Anchor terminal for safety systems for coverings, comprising anchor means (1), associated with a support (2), featuring connection means, to which at least two side elements (3, 4) are rotationally linked to lean on the covering, characterized in that said at least two side elements (3, 4) and/or said support (2) feature a number of bends which, upon being adequately loaded, become plastic hinges.

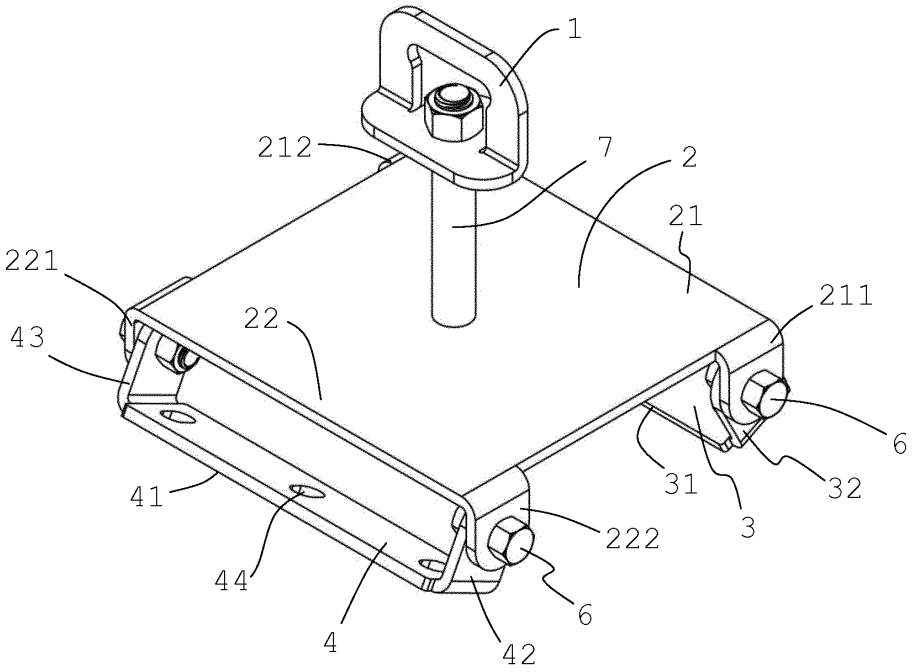

FIG. 2

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Description

Technical Field

[0001] The present invention belongs to the sector of the permanent anti-falling devices, i.e. to whatever it is necessary to install on roofs and, in general, on buildings coverings for being used during covering operations to prevent the risk of operator fall.

Background Art

[0002] Only for relatively few years is it compulsory to install such devices on the buildings coverings as to allow the operators working on the roofs to easily connect the safety harnesses worn by them thereto, by means of appropriate connection means.

[0003] The means used to connect to one end are usually connected to the harness worn by the operator whereas, at the other end, they are connected to the permanent safety systems the coverings are equipped with.

[0004] These permanent safety systems comprise anchor terminals, and the latter can be used to secure the connection means thereto, or they can be used to support further permanent elements, including, for instance, ropes. In this latter case, the safety harness could either be secured to the anchor terminal or be slidingly associated with a rope extending between several terminals; this second configuration aims at rendering operator displacements easier, besides offering them a greater radius of action.

[0005] The anchor terminals comprise appropriate connection means to make connections easier and the latter are often, but not exclusively, shaped like a closed-ring eyebolt.

[0006] Moreover, the anchor terminals comprise appropriate fixing means to the covering; said means to fix vary as a function of the type of covering on which the terminal shall be located, for instance the fixing means might be screws or chemical dowels or through bolts, should the intrados of the covering be accessible.

[0007] One of the very real problems comes from the fact that the surfaces of the building coverings are often sloped, as necessary to drain meteoric water or snow. In fact, coverings are often made up of flat pitches joined together along a side, so as to form a so called ridge line or a so called valley.

[0008] Very popular is the trend to install the anchor terminals along the ridge lines or along the valleys because such an arrangement enables the operator to easily reach both pitches.

[0009] This is the reason why a variety of variable-geometry anchor terminals have been specifically developed to be located along the ridge lines of coverings; an example thereof is described in EP 2228506 A1, which shows an anchor terminal whose base is fixed in the middle section and comprises two side fins featuring a substantially rectangular shape, hinged to the central section along a side, so that the side fins are free of rotating along a side, up to leaning on the pitches.

[0010] WO 99/27213 also shows a variable-geometry anchor terminal basically designed for being mounted on ridge lines.

[0011] However, anchor terminals like that described in EP 2,228,506 A1 or WO 99/27213 are not suitable for being mounted on ridge lines of coverings made of prefabricated "Π" (pi) beams, where the contact line between adjacent beams often runs below the extrados of the covering.

[0012] In the case of coverings with valleys, and especially in the case of coverings made of prefabricated "Y" beams, the variable-geometry anchor terminals, which have been basically developed for mounting on ridge lines of pitch coverings, might hinder a free flowing of meteoric waters if mounted in correspondence with the valley lines.

Summary of invention

[0013] None of the patents mentioned above tackles at all a further aspect that recently became very important in designing anchor terminals.

[0014] This further aspect relates to how are the loads transferred and how are they reduced by dissipating part of the energy developed by the operators when falling down, in order to reduce the stresses, in particular those onto the fixing means and the covering.

[0015] Specifically, the present invention has been developed to reduce the action directly transferred to the anchor terminal's fixing means, while simultaneously making it possible to install the anchor terminal in correspondence with valleys of two-pitch coverings, for instance along the line in the middle of prefabricated "Y" beams, or in the ridge position of two-pitch coverings, especially if these are made of prefabricated "Π" (pi) beams.

[0016] Given its peculiarity, the terminal described in this patent application can also be advantageously used in conjunction with flat coverings or vertical walls, by mainly taking advantage of its energy absorbing capabilities; on the other hand, its adjustable geometry makes it also suitable for being mounted in correspondence with diaphragms or others. Advantageously does the anchor terminal described in the present patent application comprise elements, interposed in the stress transmission chain, which are simultaneously adjustable, to fit the different arrangements of the coverings, and, thanks to their deformation by plasticization, such as to reduce the loads transmitted by the operator connection means to the covering fixing means.

[0017] A further important effect of the plasticization of said elements is in that they introduce a time shift in load transmission.

[0018] In order to understand the operation of the invention, let's remind that those who are expert in this sector know that, in a structural element, a bend consti-

tutes a preformation that, under appropriate load conditions, might be transformed into a plastic hinge.

[0019] So, according to a preferred embodiment of this invention, the adjustable elements leaning on the covering (3, 4) are realized by drilling and bending a metal plate, in order to pre-form plastic hinges destined to get deformed if adequately loaded, thus absorbing part of the fall energy and shifting the loads in time.

[0020] For the same purpose, the support (2) could also be made of materials that have been submitted to bendings, thus increasing the energy absorbing effect by the side elements (3, 4) or even fully replacing them.

Brief description of the drawings

[0021]

- Fig. 1 is an axonometric view of the anchor terminal which shows, above the support (2) featuring a substantially rectangular shape, the anchor means (1), realized in the form of closed-ring eyebolts, secured to said support (2) by a bolt. The figure also shows the two side elements (3, 4) leaning on the covering, in their version comprising fins located externally with respect to the supporting plate (2) and the hinges (6) consisting of bolts complete with washers.
- Fig. 2 shows an axonometric view of an invention's configuration in which the anchor means (1) are secured to the support (2) not directly, but rather via a supporting rod (7). In this configuration, the fins of the two side elements (3, 4) leaning on the covering are located internally with respect to the supporting place (2) and the hinges (6) consist of bolts complete with washers.
- Fig. 3 shows an invention's configuration in which there is no supporting rod (7), but with hinges (6) consisting of pivots held in position by split pins.
- Fig. 4 shows and invention's configuration with no supporting rod (7), in which the hinges (6) consist of bolts complete with washers and the two side elements (3, 4) are realized according to a further embodiment, usable to have the loads shared over a greater surface.
- Fig. 5 shows an invention's configuration with no supporting rod (7), fixed in correspondence with a valley of a two-pitch covering, and specifically fixed along the center line of a prefabricated "Y" beam.
- Fig. 6 shows and invention's configuration complete with supporting rod (7), fixed in correspondence with a valley of a two-pitch covering, and specifically fixed along the center line of a prefabricated "Y" beam.
- Fig. 7 shows an invention's configuration complete with supporting rod (7) fixed along the ridge line of a two-pitch covering, made of prefabricated "Π" (pi) beams.

Detailed description of an embodiment of the invention

[0022] The terminal according to the present invention comprises connection means (1), usually, but not exclusively, consisting of one or several eyebolts, to be associated with the connection means via a safety harness, and fixed to a support (2), the latter being advantageously realized by a plate, often featuring a substantially rectangular shape, which at least two side elements (3, 4) are rotationally associated with and constitute the resting interface to the covering and also operate as fall energy dissipation elements in that, thanks to their plastic deformation, they reduce the actions transferred to the points where the components are fixed to the covering, besides shifting them in time.

[0023] Such energy absorption effect might also be achieved or however incremented by bending the support (2).

[0024] Each of said at least two side elements (3, 4) leaning on the covering is rotationally associated with said support (2) in correspondence with two opposite sides (21, 22) of the rectangle.

[0025] In a preferred embodiment of the invention, both the support (2) and the side elements (3, 4) are made of a cut and bent metal plate, hence said support (2) comprises a former pair of drilled fins (211, 212) at the ends of the former (21) of said opposite sides and a second pair of drilled fins (221, 222) at the ends of the second (22) of said opposite sides. For the reasons explained above, each of said resting side elements consists of a plate (3 or 4) featuring a longitudinal surface (31 or 41) in the middle leaning on the covering and comprising two right-angle bent fins (42, 43 or 32, 33), each of the latter presenting a hole used to rotationally associate them with the support via appropriate hinges (6).

[0026] As a matter of fact, according to the recommended installation procedure, the anchor terminal shall be laid down onto the covering, by first properly orienting the support (2) and subsequently making the longitudinal leaning surface (31 or 41) of each of the two side elements (3, 4) adhere to the covering, thus orienting said side elements (3, 4) according to the slope of the pitches and marking the positions of the holes (44) that shall receive the covering fixing means.

[0027] As a last step, the fixing means are installed and laid down, thus securing the side elements (3, 4) to the covering; finally, if the hinges (6) of the anchor terminal consist of bolts, these shall be tightened.

Claims

1. Anchor terminal for safety systems for coverings, comprising anchor means (1), associated with a support (2), featuring connection means, to which at least two side elements (3, 4) are rotationally linked to lean on the covering, **characterized in that** said

at least two side elements (3, 4) and/or said support (2) feature a number of bends which, upon being adequately loaded, become plastic hinges.

2. Anchor device according to the previous claim, **characterized in that** said support (2) is built starting from a plate.

3. Anchor device according to one or more of the previous claims, **characterized in that** said plate comprises a number of bends.

4. Anchor device according to one or more of the previous claims, **characterized in that** said at least two side elements (3, 4) are rotationally linked to two opposite sides of said support (2).

5. Anchor device according to one or more of the previous claims, **characterized in that** said support (2) comprises a first pair of drilled fins (211, 212) at the two ends of the former (21) of said opposite sides, and a second pair of drilled fins (221, 222) at the two ends of the second (22) of said opposite sides.

6. Anchor terminal according to one or more of the previous claims, **characterized in that** each of said leaning side elements (3, 4) consists of a plate featuring a central surface (31, 41) to lean on the covering and two right-angle bent fins (42, 43) and (32, 33) at the ends.

7. Anchor terminal according to one or more of the previous claims, **characterized in that** the two fins (42, 43) and (32, 33) are drilled.

8. Anchor terminal according to one or more of the previous claims, **characterized in that** appropriate hinges (6) join each of the drilled fins of said former pair (311, 212) or second pair (221, 222) to each of said drilled fins of each side element (3, 4) used to lean to the covering.

9. Anchor terminal according to one or more of the previous claims, **characterized in that** each of said support surfaces (31, 41) comprises one or several holes (44) to receive the fixing means to the covering.

10. Anchor terminal according to one or more of the previous claims, **characterized in that** said hinges (6) consist of bolts, possibly also including anti-unscrewing systems.

11. Anchor terminal according to one or more of the previous claims, **characterized in that** said hinges (6) consist of pins held in positions by split pins or other anti-slipping means.

12. Anchor terminal according to one or more claims 1 thru 9, **characterized in that** said hinges (6) consist of a bar that goes through the drilled fins of the support (2) as well as the fins of one of the elements (3, 4) used to lean to the covering.

13. Anchor terminal according to the previous claim, **characterized in that** said bar is held in position by appropriate anti-slipping means including, for example, spring rings or split pins.

14. Anchor terminal according to one or more of the previous claims, **characterized in that** said anchor means (1) are secured to said support (2) by a supporting rod (7).

15. Anchor terminal according to one or more of the previous claims, **characterized in that** said anchor means (1) are either fixed or rotating with respect to the support plate (2).

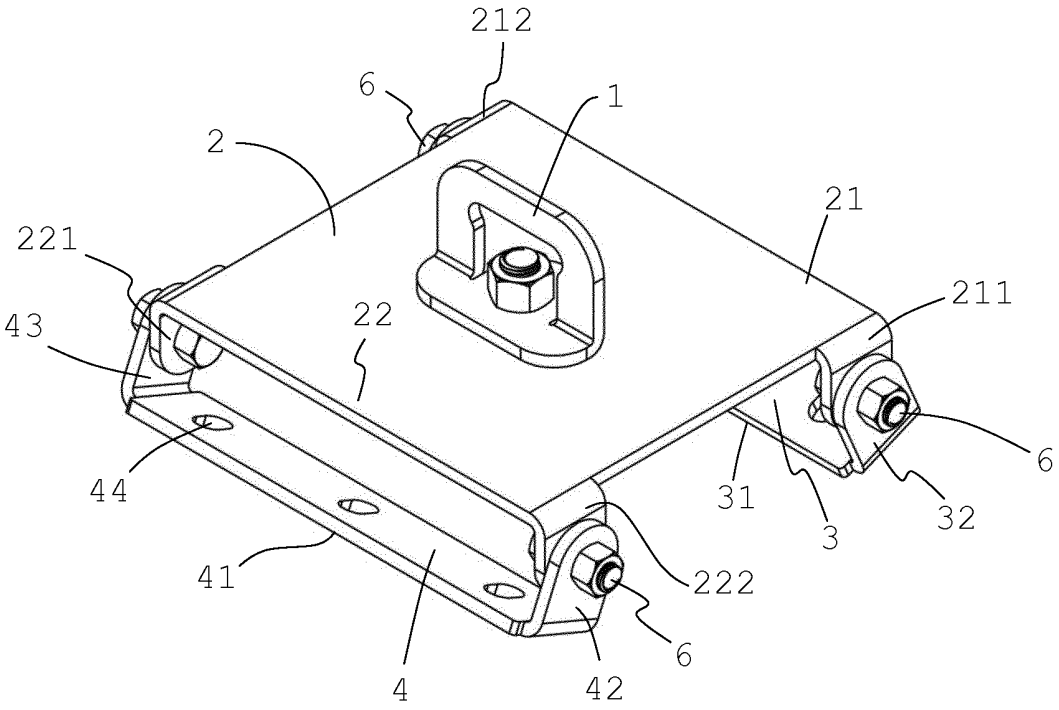
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FIG. 1

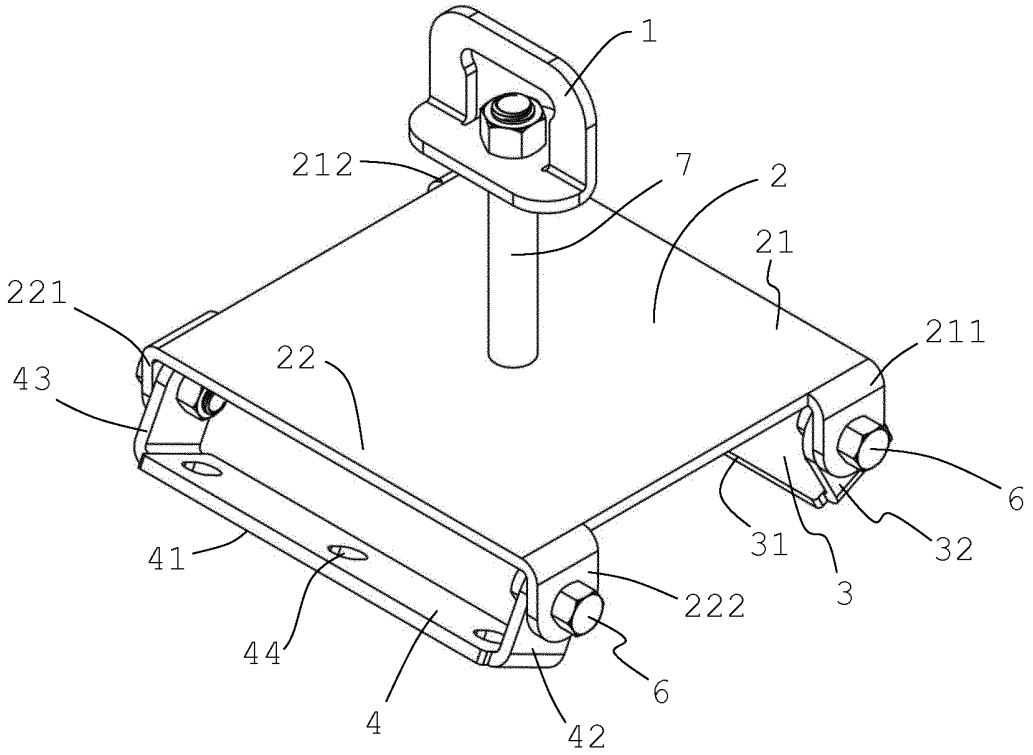
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FIG. 2

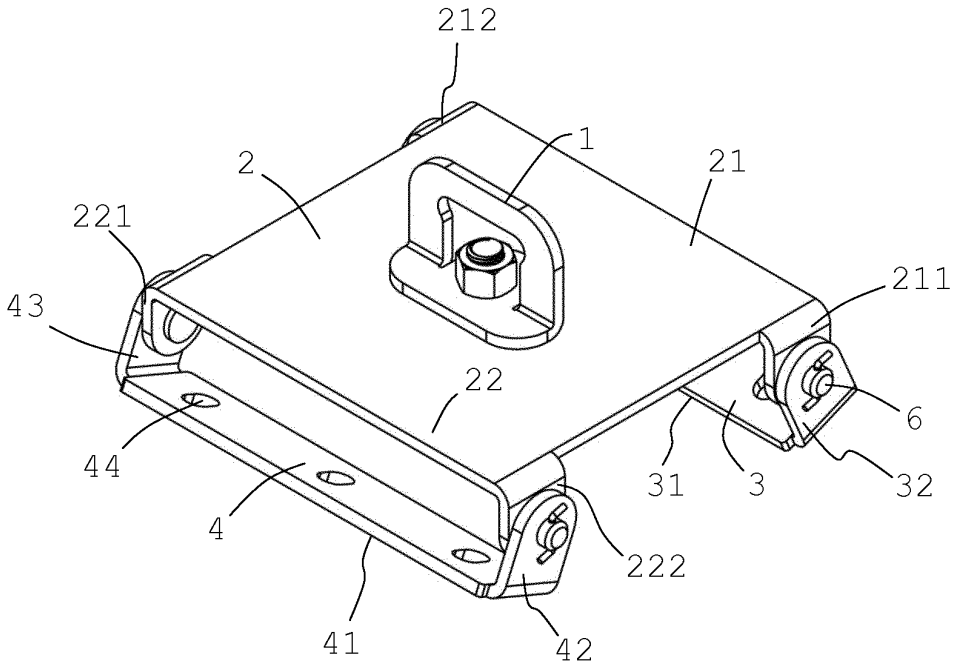
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FIG. 3

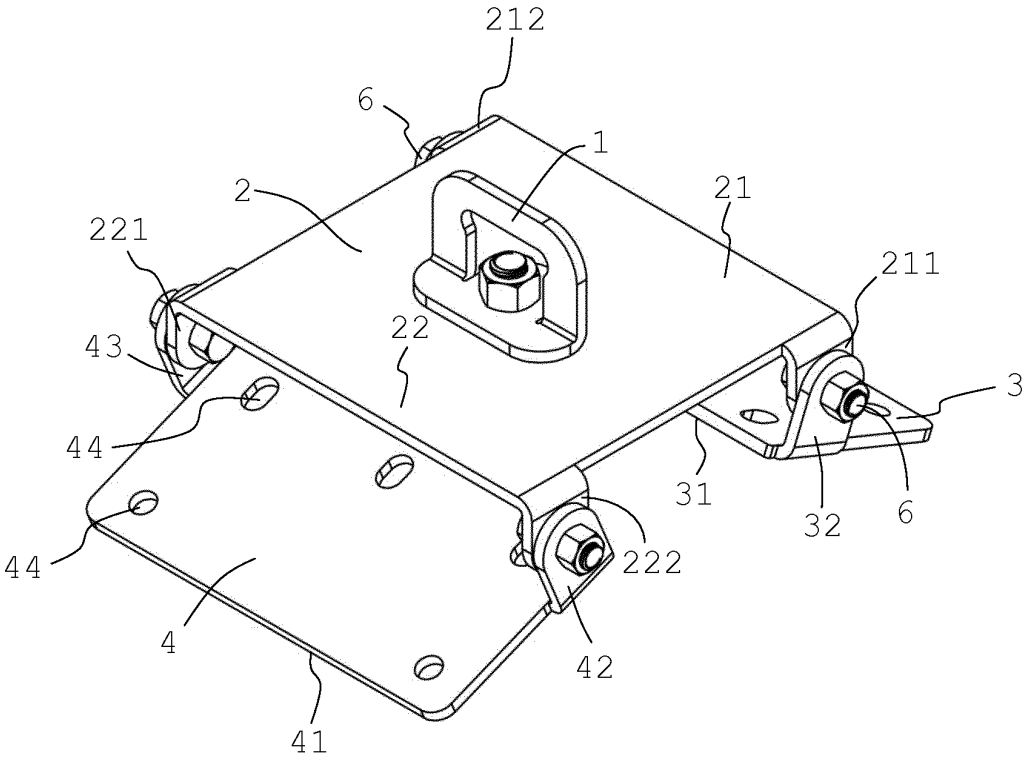
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FIG. 4

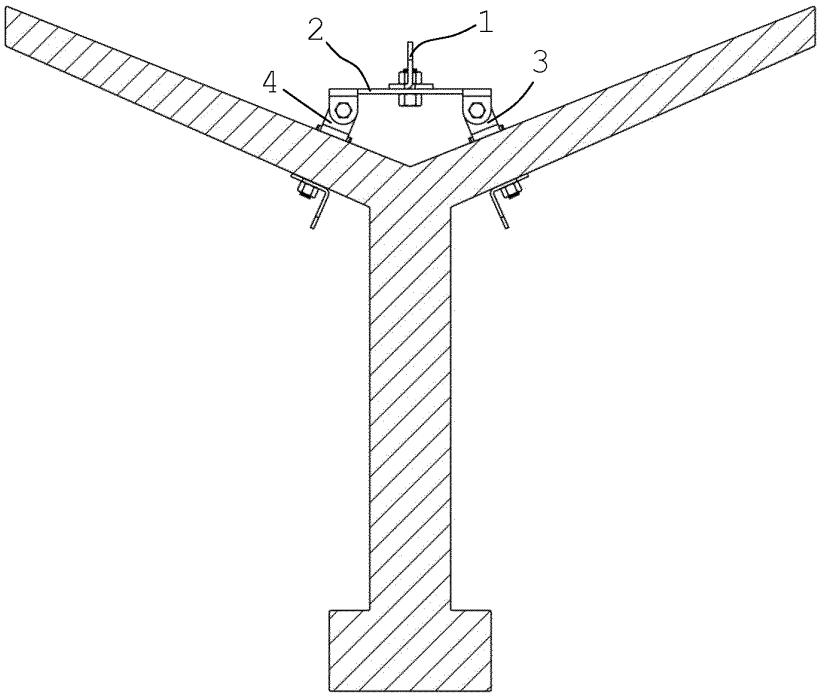

FIG. 5

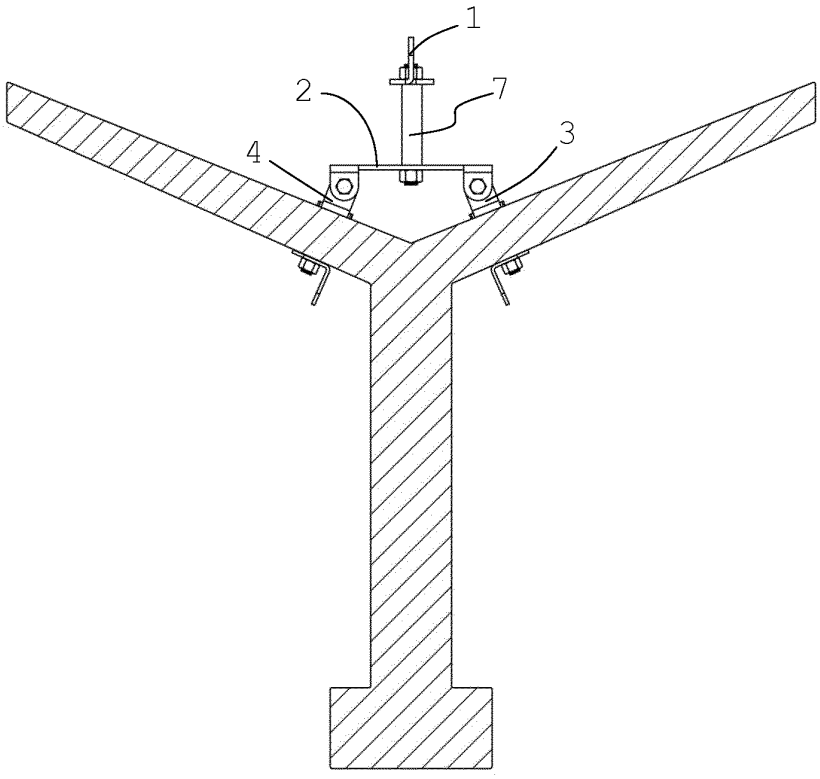

FIG. 6

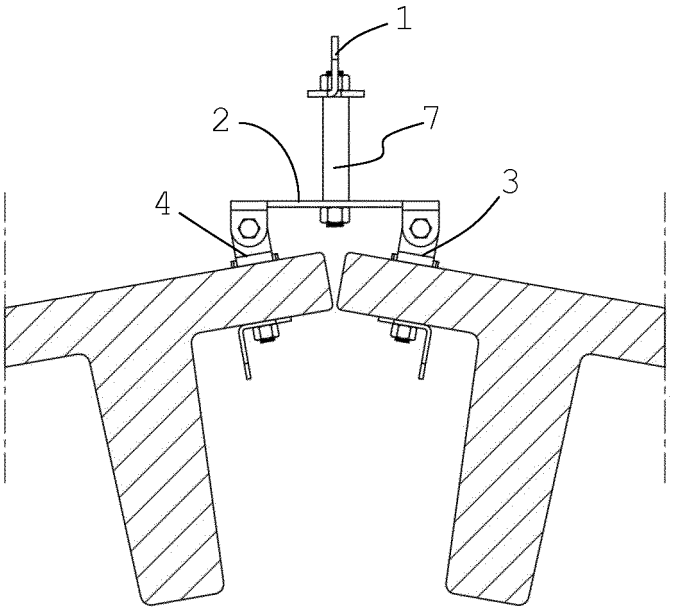

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 5696

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 2 228 506 A1 (GANDELLINI BENIAMINO S R L [IT]) 15 September 2010 (2010-09-15) * abstract; figures *	1-15	INV. E04G21/32
A,D	WO 99/27213 A1 (POLDMAA ARVO [AU]) 3 June 1999 (1999-06-03) * page 4, line 10 - page 8, line 12; figures *	1-15	
A	WO 2008/081375 A1 (SI AL S R L [IT]; GANDELLINI ALBERTO [IT]; MIGLIO SIMONE [IT]) 10 July 2008 (2008-07-10) * abstract; figures *	1-15	
A	EP 2 292 874 A1 (GANDELLINI BENIAMINO S R L [IT]) 9 March 2011 (2011-03-09) * column 7, line 19 - column 8, line 6; figures *	1-15	
A	FR 2 888 298 A1 (L R ETANCO SOC PAR ACTIONS SIM [FR]) 12 January 2007 (2007-01-12) * abstract; figures *	1-15	TECHNICAL FIELDS SEARCHED (IPC) E04G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 March 2013	Scharl, Willibald

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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01-03-2013

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

REFERENCES CITED IN THE DESCRIPTION

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- EP 2228506 A1 **[0009] [0011]**
- WO 9927213 A **[0010] [0011]**