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(54) HIGHWAY GUARDRAIL WITH JOINT AND STIFFENER SYSTEM

AUTOBAHNLEITPLANKE MIT VERBINDUNGS- UND VERSTEIFUNGSSYSTEM

GLISSIÈRE DE SÉCURITÉ D' AUTOROUTE AVEC SYSTÈME DE JOINT ET DE RENFORT

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Description

[0001] The object of the present invention is a joint and stiffener system for a highway guardrail, which highway guardrail is composed of essentially vertical guardrail pillars installed at a distance from one another and of essentially horizontal rails fixed to them, which rails are open profiles, the open part of which is directed towards the guardrail pillar, and which joint and stiffener system comprises a joint part/stiffener part.

[0002] The invention relates generally to highway guardrails and more particularly to the center guardrails of traffic lanes, which have recently become rapidly more widespread. They are used for safety reasons to prevent head-on accidents of vehicles moving in opposite directions. By means of center guardrails, of course, overtaking can be prevented in places where it would be dangerous. Center guardrails have become widely adopted, particularly on highways with an overtaking lane.

[0003] Center guardrails are composed of essentially vertical metallic guardrail pillars that are embedded and/or fixed into the ground at a distance from each other, as well as of metallic guides, i.e. essentially horizontal guardrail parts, fixed to them. The terms "vertical" and "horizontal" are not, of course, mathematically precise in this context, because they vary according to the profile of the ground surface on the highway. In highway guardrails the critical points are the point of connection between the guardrail pillar and the rail and also the point of connection between two rails. In addition, it is endeavored to stiffen the rails in the section between the guardrail pillars so that the rails would withstand possible impacts better while retaining their shape.

[0004] In many prior-art guardrail solutions a joint part comprising a number of parts is used between the guardrail pillar and the rail (e.g. EP 1947245 A1) as well as oval perforations in the rail/joint part, said perforations allowing small tolerances. In addition, stiffener rods, fabricated from L-shaped steel bars, said rods to be fastened to the bottom edge of the rail by welding, are often used as a stiffener. It is also typical that completely different types of parts are used as a stiffener, as a fastener of the guardrail pillar and as a splice of a rail.

[0005] Publication WO 03104568 presents a solution wherein the rail of a guardrail is formed from a C-shaped beam. At the point of connection the beam is tapered and it is installed inside the next rail and locked with bolts and nuts. This publication does not disclose in more detail how the guardrail pillars and the rails are fastened to each other.

[0006] Publication WO 9842918 presents a highway guardrail wherein the rails are also open profiles. They are joined together with a joint piece of essentially the same cross-sectional shape and of slightly smaller dimensions, on top of which joint piece the rails to be connected are installed, and which joint piece is also an open profile. Thus a joint piece is used here only in a splice joint between two rails.

[0007] KR101052243B1 relates to a multi-stage shock absorption guide rail. A rail of rectangular pipe shape is connected to a post. A protrusion and an opening are formed on the front and rear sides of the rail. Reinforcing ribs are formed on both upper and lower sides of the opening. A short support pipe of rectangular pipe shape is inserted in the rail. A bracket includes a support panel which is attached to the rear side of the rail and a fixing panel which is welded to the post.

[0008] DE20113347U1 relates to a modular steel crash barrier in which sections may be attached to each other with pins.

[0009] DE102006038336B3 discloses an arrangement with C-shaped profile strands extending along a center elevational area and an upper end of an anchoring pole. A protection plank strand extends before the strand in the area. Two profile strand shots of the profile strands are arranged in a distance and are connected at a dilatation section by a dilatation shot. A bracing profile is provided in the dilatation shot, overlaps the dilatation shot and the profile strand shot in a form-fit manner and connects the dilatation shot and the profile strand shots.

[0010] JP2005076349A discloses a protective fence for vehicles. The fence is provided with a plurality of supports erected along a driveway, an upper step horizontal beam and a lower step horizontal beam erected at a driveway side of the plurality of the supports. Each support has a steel-made casting and the upper step horizontal beam and the lower step horizontal beam are aluminum-made extrusion shaped materials. In addition, the outer shape of the driveway side of the upper step horizontal beam and the lower step horizontal beam is formed into an elliptical circular-arc.

[0011] FR1220041A and JPS5465538U both relate to rails with vertical pillars and horizontal elements extending between the pillars.

[0012] The aim of the invention is to achieve a joint and stiffener arrangement for a highway guardrail that does not have the drawbacks occurring in prior art and that has many other advantages also compared to earlier guardrails. The highway guardrail according to the invention is characterized in that the guardrail pillar has a planar top end having an essentially horizontal top edge against which the open side of the rail is placed and also a joint part/stiffener part is installed at least partly inside the rail, at said joint of the rail with the guardrail pillar, and in that the joint part/stiffener part is also used to stiffen the rails in the section between the guardrail pillars.

[0013] One preferred embodiment of the joint and stiffener arrangement according to the invention is characterized in that the cross-section of the joint part/stiffener part is of essentially the same shape as the cross-section of the rail, and in that the outer dimensions of the joint part/stiffener part are smaller than the inner dimensions of the rail, in which case the joint part/stiffener part can be fitted inside the rail by threading from the end of the rail.

[0014] A second preferred embodiment of the joint and stiffener arrangement according to the invention is char-

acterized in that the guardrail pillar has an essentially horizontal top edge, in which is a hole for a bolt, in that inside the rail at the point of connection is a joint part/stiffener part, in which is a corresponding hole for a bolt, and in that a nut is threaded onto the bolt for tightening the joint or there is a threaded hole in the joint part/stiffener part.

[0015] Yet another preferred embodiment of the joint and stiffener arrangement according to the invention is characterized in that between the top edge of the guardrail pillar and the joint part/stiffener part a shim of essentially the thickness of the material of the rail is installed, through which shim a bolt is also installed.

[0016] One of the advantages of the invention that can be mentioned is that the guardrail pillar can be fixed to the rail at any point of the rail whatsoever. In addition, the tight installation tolerances in the longitudinal direction of the joint between the guardrail pillar and the rail are eliminated and installation is essentially speeded up. Separate perforations are not needed in the rail at the point of the fastener. Furthermore, stiffener parts to be fastened by welding that assist the permanence of the shape of the rail are not needed in the structure according to the invention. That being the case, fabrication of the rail is considerably facilitated and perforations in the rail at the point of the stiffener are not needed.

[0017] It can further be mentioned that the stiffener part of the rail, the fixing part of the guardrail pillar and the splice part of the rail are based on the same type of closed profile, in which case instead of the three completely different parts required earlier, only two parts of different lengths based on one closed profile are required.

[0018] In the following, the invention will be described in more detail by the aid of some preferred embodiments with reference to the attached drawings, wherein

Fig. 1 presents highway guardrail according to the invention, as viewed from the side.

Fig. 2 presents a longitudinal section of the detail A of Fig. 1.

Fig. 3 presents a cross-section of the detail A of Fig. 1.

Fig. 4 presents a cross-section of the detail C of Fig. 1.

Fig. 5 presents a longitudinal section of the detail B of Fig. 1.

[0019] The highway guardrail, in this case more particularly the center guardrail of a highway, is composed of essentially vertical guardrail pillars 1, which are fixed into the ground 3 preferably at essentially regular intervals, and of rails 2 fixed to the guardrail pillars. The detail A marked in Fig. 1 refers to the point of connection between a guardrail pillar 1 and a rail 2 and it is described in more detail in the cutaway drawing of Figs. 2 and 3.

[0020] Further, in Fig. 1 the detail B refers to the stiff-

ening point of the rail and it is presented in more detail in the cutaway drawing of Fig. 5. The detail C of Fig. 1 refers to the splice joint point between two rails and it is presented in more detail in Fig. 4.

[0021] The guardrail pillar 1 is preferably an open profile, e.g. a C-profile or a sigma profile. On its top end is an essentially horizontal top edge 5, which is e.g. bent to be horizontal or is formed by welding a slab to the top end of the guardrail pillar or an angle bar is fixed to it with bolts. The aperture side of a rail 2 having an open profile is installed against this planar top end, as can be seen in Fig. 3.

[0022] A joint part/stiffener part 4 having a closed profile is pushed inside the rail 2, as can be seen more particularly in Fig. 3. The term closed profile refers here to all the embodiments in which the peripheral rigidity of the joint part/stiffener part 4 is essentially greater than that of the rails 2. Thus the term closed profile means an envelope wholly surrounding an empty space, i.e. a tubular profile, or a closed profile fabricated from completely solid material. The term closed profile also refers to profiles of all shapes, the thickness of the wall of which profiles is essentially greater than that of the rail 2, preferably at least five times the wall thickness of the rail.

[0023] The most advantageous embodiment of a joint system/stiffener system 4 is a tubular profile, which has a sufficient peripheral rigidity and at the same time a small material requirement. By using a closed profile as a joint part/stiffener part of a guardrail, surprisingly the total rigidity of the guardrail significantly increases.

[0024] The joint part/stiffener part 4 is of essentially the same cross-sectional shape as the rail 2 except for the aperture point of the rail. The joint part/stiffener part 4 is, however, smaller in its outer dimensions than the inner dimension of the rail 2, in which case it fits to move in the rail. In practice the fitting is, however, rather tight, so that the joint part/stiffener part 4 stiffens the rail 2. The length of the joint part/stiffener part is preferably approx. 100 mm, but the invention is not, of course, limited to this.

[0025] In the joint part/stiffener part is a hole, which is placed at the same point as the hole in the horizontal top edge 5 of the guardrail pillar 1. Through these holes a bolt is pushed in the manner presented by Figs. 2 and 3. The bolt, and thereby the whole joint, is tightened with a nut. Additionally, a shim 6 of essentially the thickness of the material of the rail 2 is arranged at the point of the aperture of the rail.

[0026] The joint part/stiffener part 4 is also used to stiffen the rail 2 in the section between the guardrail pillars, in addition to at the point of a guardrail pillar. This is presented as a longitudinal section in Fig. 5. This stiffening is implemented such that a joint part/stiffener part 4, as already described, is threaded inside the rail 2 such that it is situated essentially mid-way between guardrail pillars. The joint part/stiffener part is locked into its position in the manner shown by Fig. 5 with a bolt/nut joint or alternatively with a nut and by means of a threaded hole in the joint part/stiffener part 4. In this case, also, approx.

100 mm is generally sufficient for the length of the joint part/stiffener part 4.

[0027] Fig. 4, for its part, presents a cross-section of the detail C of Fig. 1. Shown here is a splice joint of two rails 2, which is implemented by using a joint part/stiffener part of the type described earlier, which is actually longer, e.g. approx. 400 mm, when used for this purpose. At the point of a splice joint, a joint part and stiffener part 4 is pushed inside the end of each rail to be joined together and the joint is locked with bolts 7, which are pushed through the holes in the top surface and bottom surface of the rail as well as through bushings 8 inside the joint part/stiffener part 4 and/or holes in the joint part/stiffener part 4 and tightened with nuts 9. Preferably there are eight units of bolts in the whole splice joint, i.e. four at each end of the rail.

[0028] The joint part/stiffener part 4 is preferably made of steel and it can therefore also be of the same material as the rail 2.

[0029] It is obvious to the person skilled in the art that the invention is not limited to the embodiments presented above, but that it can be varied within the scope of the claims presented below.

[0030] The characteristic features possibly presented in the description in conjunction with other characteristic features can also, if necessary, be used separately to each other.

Claims

1. Highway guardrail composed, in use, of essentially vertical guardrail pillars (1) installed at a distance from one another, of essentially horizontal rails (2) fixed to them, which rails are open profiles, the open part of which is directed towards the guardrail pillar (1), and of a joint and stiffener system comprising a joint part/stiffener part (4), wherein the guardrail pillars (1) have a planar top end against which the open side of the rail (2) is placed, wherein the joint part/stiffener part (4) is a closed profile (4) and is installed at least partly inside the rail (2) at the point of connection with a guardrail pillar (1), **characterized in that** a further of such joint part/stiffener parts (4) is used to stiffen the rail (2) in the section between the guardrail pillars (1), in addition to at the point of a guardrail pillar (1).
2. Highway guardrail according to claim 1, **characterized in that** the cross-section of the joint part/stiffener part (4) is of essentially the same shape as the cross-section of the rail (2), and **in that** the outer dimensions of the joint part/stiffener part (4) are smaller than the inner dimensions of the rail (2), in which case the joint part/stiffener part (4) can be fitted inside the rail (2) by threading from the end of the rail.
3. Highway guardrail according to claim 1 or 2, **char-**

acterized in that the guardrail pillar (1) has an essentially horizontal top edge (5), in which is a hole for a bolt, and that inside the rail (2) at the point of connection is a joint part/stiffener part (4), in which is a corresponding hole for a bolt, and **in that** a nut is threaded onto the bolt for tightening the joint or there is a threaded hole in the joint part/stiffener part.

4. Highway guardrail according to claim 3, **characterized in that** between the top edge (5) of the guardrail pillar (1) and the joint part/stiffener part (4) a shim (6) of essentially the thickness of the material of the rail is installed, through which shim a bolt is also installed.
5. Highway guardrail according to any of claims 1-4, **characterized in that** the length of the joint part/stiffener part (4) is approx. 100 mm.
6. Highway guardrail according to claim 1 or 2, **characterized in that** the joint part/stiffener part (4) can be used in forming a splice joint between two rails (2), in which case the joint part/stiffener part (4) is pushed inside the end of each rail (2), and **in that** the splice joint is locked with bolts (7) extending through the rail and the joint part/stiffener part.
7. Highway guardrail according to claim 6, **characterized in that** the length of the joint part/stiffener part (4) is approx. 400 mm, and **in that** in it are formed bushings (8) or holes for bolts.
8. Highway guardrail according to claim 7, **characterized in that** there are eight units of bolts (7) and bushings (8), four at each end of a rail (2) to be joined together.
9. Highway guardrail according to any of claims 1-8, **characterized in that** the wall thickness of the joint part/stiffener part (4) is greater than the wall thickness of the rail (2), preferably at least five times the wall thickness of the rail.

Patentansprüche

1. Schutzplanke für Fernstraßen, die im Gebrauch aus im Wesentlichen vertikalen Schutzplanckenpfosten (1), die in einem Abstand voneinander montiert sind, aus im Wesentlichen horizontalen Schienen (2), die auf ihnen angebracht sind, wobei die Schienen offene Profile sind, von denen der offene Teil gegen die Schutzplanckenpfosten (1) gerichtet ist, und aus einer Verbindungs- und Versteifungsanordnung, die ein Verbindungsteil/Versteifungsteil (4) umfasst, besteht, wobei die Schutzplanckenpfosten (1) ein flaches oberes Ende aufweisen, das an die offene Seite der Schiene (2) angelegt ist, wobei das Verbindungs-

- teil/Versteifungsteil (4) ein geschlossenes Profil (4) ist und zumindest teilweise innerhalb der Schiene (2) an dem Verbindungspunkt mit einem Schutzplanckenpfosten (1) angebracht ist, **dadurch gekennzeichnet, dass** ein weiteres dieser Verbindungsteile/Versteifungsteile (4) genutzt wird, um die Schiene (2) im Bereich zwischen den Schutzplanckenpfosten (1) zusätzlich zum Verbindungspunkt eines Schutzplanckenpfostens (1) zu versteifen.
2. Schutzplanke für Fernstraßen nach Anspruch 1, **dadurch gekennzeichnet, dass** der Querschnitt des Verbindungsteils/Versteifungsteils (4) im Wesentlichen dieselbe Form aufweist, wie der Querschnitt der Schiene (2), und dadurch, dass die Außenmaße des Verbindungsteils/Versteifungsteils (4) kleiner sind als die Innenmaße der Schiene (2), wodurch das Verbindungsteil/Versteifungsteil (4) in die Schiene (2) durch Einziehen vom Ende der Schiene her eingeführt werden kann.
3. Schutzplanke für Fernstraßen nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Schutzplanckenpfosten (1) eine im Wesentlichen horizontale Oberkante (5) aufweist, in der eine Bohrung für eine Schraube vorgesehen ist, und dass in der Schiene (2) am Verbindungspunkt ein Verbindungsteil/Versteifungsteil (4) angeordnet ist, in dem eine zugehörige Bohrung für eine Schraube angeordnet ist, und dass eine Mutter gibt, die auf die Schraube gedreht wird, um die Verbindung festzuziehen, oder dass es eine Gewindebohrung im Verbindungsteil/Versteifungsteil gibt.
4. Schutzplanke für Fernstraßen nach Anspruch 3, **dadurch gekennzeichnet, dass** zwischen der Oberkante (5) des Schutzplanckenpfostens (1) und dem Verbindungsteil/Versteifungsteil (4) eine Unterlegscheibe (6) von im Wesentlichen der Dicke des Materials der Schiene angebracht ist, wobei durch die Unterlegscheibe ebenfalls eine Schraube montiert wird.
5. Schutzplanke für Fernstraßen nach einem der Ansprüche 1 - 4, **dadurch gekennzeichnet, dass** die Länge des Verbindungsteils/Versteifungsteils (4) ca. 100 mm beträgt.
6. Schutzplanke für Fernstraßen nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das Verbindungsteil/Versteifungsteil (4) genutzt werden kann, um eine Laschenverbindung zwischen zwei Schienen (2) auszubilden, wodurch der Verbindungsteil/Versteifungsteil (4) in das Ende von jeder Schiene (2) gedrückt wird, und dass die Laschenverbindung mit Schrauben (7) befestigt ist, die sich durch die Schiene und das Verbindungsteil/Versteifungsteil erstrecken.
7. Schutzplanke für Fernstraßen nach Anspruch 6, **dadurch gekennzeichnet, dass** die Länge des Verbindungsteils/Versteifungsteils (4) ca. 400 mm beträgt, und dass darin Buchsen (8) oder Bohrungen für Schrauben ausgestaltet sind.
8. Schutzplanke für Fernstraßen nach Anspruch 7, **dadurch gekennzeichnet, dass** acht Schrauben- (7) und Buchsen- (8) Elemente, vier an jedem Ende einer Schiene (2), die zu verbinden sind, vorhanden sind.
9. Schutzplanke für Fernstraßen nach einem der Ansprüche 1 - 8, **dadurch gekennzeichnet, dass** die Wandstärke des Verbindungsteils/Versteifungsteils (4) größer ist als die Wandstärke der Schiene (2), vorzugsweise mindestens fünfmal so groß wie die Wandstärke der Schiene.

Revendications

1. Glissière de sécurité pour autoroute composée, en service, de montants de glissière de sécurité sensiblement verticaux (1) installés à distance l'un de l'autre, de rails sensiblement horizontaux (2) qui leur sont fixés, lesquels rails sont des profilés ouverts, dont la partie ouverte est dirigée vers le montant de glissière de sécurité (1), et d'un système de jonction et de renfort comprenant une partie de jonction/ partie de renfort (4), dans laquelle les montants de glissière de sécurité (1) ont une extrémité supérieure plane contre laquelle le côté ouvert du rail (2) est placé, dans laquelle la partie de jonction/partie de renfort (4) est un profil fermé (4) et est installée au moins en partie à l'intérieur du rail (2) au point de liaison avec le montant de glissière de sécurité (1), **caractérisé en ce qu'une autre de ces parties de jonction/parties de renfort (4) est utilisée pour renforcer le rail (2) dans la section entre les montants de rail de sécurité (1) en plus de la pointe d'un montant de glissière de sécurité (1).**
2. Glissière de sécurité pour autoroute selon la revendication 1, **caractérisée en ce que** la section transversale de la partie de jonction/partie de renfort (4) a sensiblement la même forme que la section transversale du rail (2) et **en ce que** les dimensions externes de la partie de jonction/partie de renfort (4) sont plus petites que les dimensions internes du rail (2), auquel cas la partie de jonction/partie de renfort (4) peut être ajustée à l'intérieur du rail (2) par vissage depuis l'extrémité du rail.
3. Glissière de sécurité pour autoroute selon la revendication 1 ou 2, **caractérisée en ce que** le montant de glissière de sécurité (1) a un bord supérieur sensiblement horizontal (5), dans lequel il y a un trou

pour un boulon, et **en ce que**, à l'intérieur du rail (2), au point de raccordement se trouve une partie de jonction/partie de renfort (4), dans laquelle se trouve un trou correspondant pour un boulon, et **en ce qu'un** écrou est vissé sur le boulon pour serrer la jonction ou il y a un trou taraudé dans la partie de jonction/partie de renfort. 5

4. Glissière de sécurité pour autoroute selon la revendication 3, **caractérisée en ce qu'**entre le bord supérieur (5) du montant de glissière de sécurité (1) et la partie de jonction/partie de renfort (4) est installée une cale (6) sensiblement de l'épaisseur du matériau du rail, à travers laquelle cale un boulon est également installé. 10
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5. Glissière de sécurité pour autoroute selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** la longueur de la partie de jonction/partie de renfort (4) est approximativement de 100 mm. 20
6. Glissière de sécurité pour autoroute selon la revendication 1 ou 2, **caractérisée en ce que** la partie de jonction/partie de renfort (4) peut être utilisée pour former une éclisse entre deux rails (2), auquel cas la partie de jonction/partie de renfort (4) est poussée dans l'extrémité de chaque rail (2), et **en ce que** l'éclisse est verrouillée avec des boulons (7) s'étendant à travers le rail et la partie de jonction/partie de renfort. 25
30
7. Glissière de sécurité pour autoroute selon la revendication 6, **caractérisée en ce que** la longueur de la partie de jonction/partie de renfort (4) est approximativement de 400 mm et **en ce que** des douilles (8) ou des trous pour des boulons y sont formés. 35
8. Glissière de sécurité pour autoroute selon la revendication 7, **caractérisée en ce qu'il** y a huit unités de boulons (7) et de douilles (8), quatre à chaque extrémité d'un rail (2) à assembler ensemble. 40
9. Glissière de sécurité pour autoroute selon l'une quelconque des revendications 1 à 8, **caractérisée en ce que** l'épaisseur de paroi de la partie de jonction/partie de renfort (4) est supérieure à l'épaisseur de paroi du rail (2), de préférence d'au moins cinq fois l'épaisseur de paroi du rail. 45

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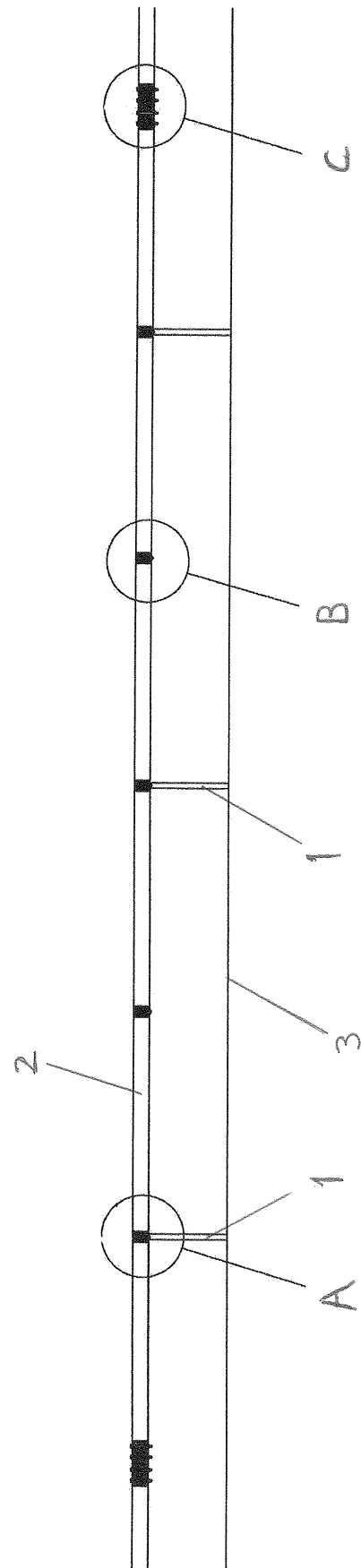


Fig.1

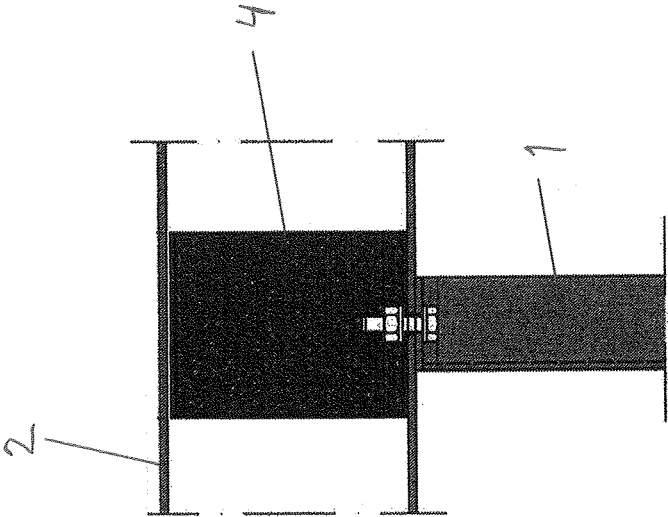


Fig. 2

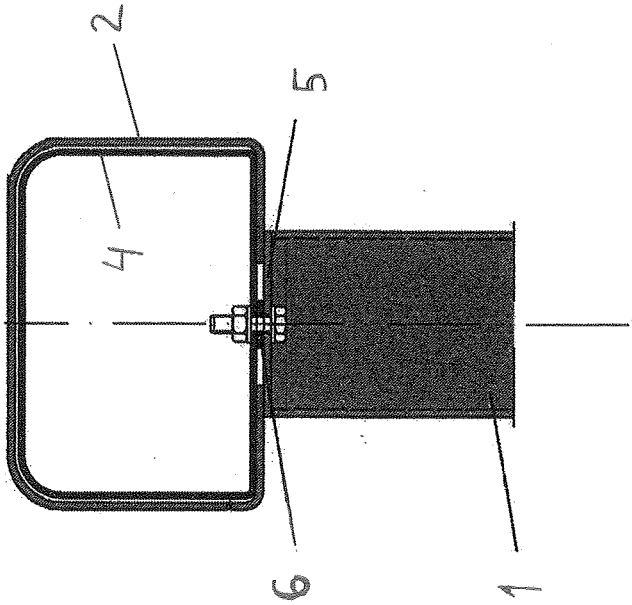


Fig. 3

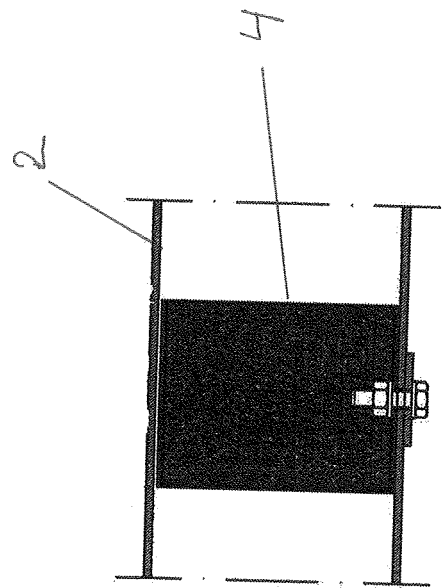


Fig. 5

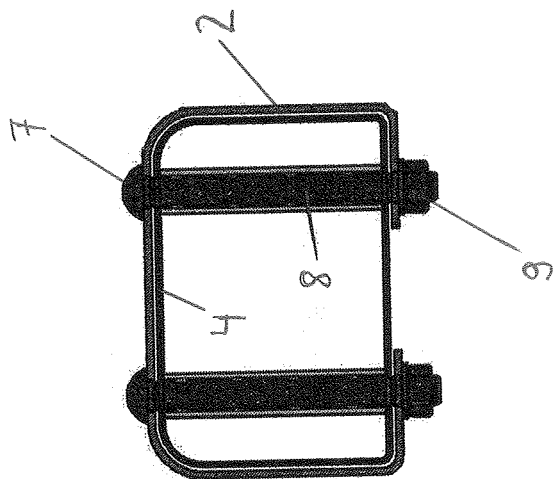


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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