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(54) A COTTER JOINT OF GUARDRAIL SECTIONS OF A SAFETY TRAFFIC BARRIER AND A SAFETY TRAFFIC BARRIER COMPRISING SUCH A COTTER JOINT

(57) The present invention relates to a cotter joint (1) of guardrail (2) sections (21) of a safety traffic barrier (5) comprising at least one bolt (3) having a transverse through hole (32) of a longitudinal axis (O3) nonparallel relative to the longitudinal axis (O2) of the bolt (3) and a resisting head (31), wherein the bolt (3) extends through mounting openings (223) of the connecting end sections (22) of the guardrail (2) sections (21) which overlap with each other and adjoin with each other by means of internal contact surfaces (221), wherein the mounting openings (223) correspond to each other and substantially coincide with each other, wherein the transverse through hole (32) of the bolt (3) is located at the side of the guardrail (2) sections (21) which overlap with each other, opposite relative to the resisting head (31), and a locking cotter (4) which is disposed in a transverse through hole (32) of the bolt (3) and tightens the guardrail (2) sections (21), which overlap with each other, against the resisting head (31) of the bolt (3). In order to provide an increased strength as well as a simple and cost-effective construction enabling a quick disassembly of such a cotter joint, the bolt (3) has a cross-section substantially corresponding to the cross-section of the mounting opening (223) of the guardrail (2) sections (21), and at least one reinforcing plate (224) is mounted on each external non-contact surface (222) of connecting end sections (22) of the guardrail (2) sections (21) which overlap with each other, wherein the reinforcing plate (224) is provided with at least one through hole (225) substantially coincided with the at least one mounting opening (223) of the guardrail (2) section (21) to which this reinforcing plate (224) is mounted.

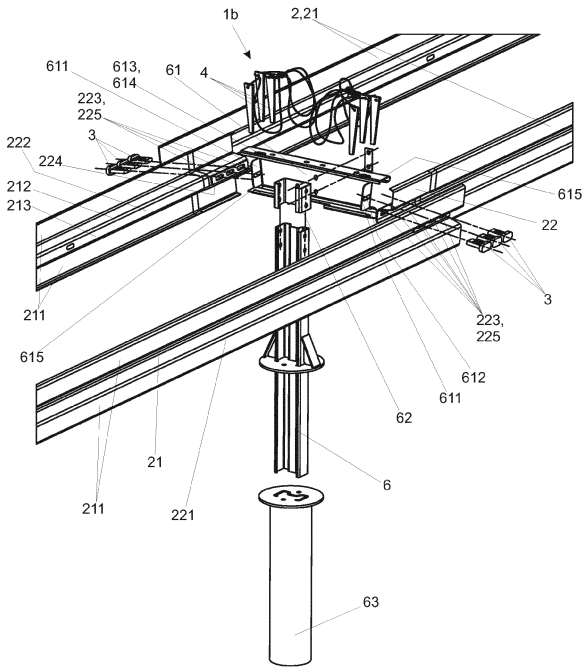

Fig. 14

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Description

[0001] The present invention relates to a cotter joint of guardrail sections of a safety traffic barrier comprising at least one bolt having a transverse through hole of a longitudinal axis nonparallel relative to the longitudinal axis of the bolt and a resisting head, wherein the bolt extends through mounting openings of the connecting end sections of the guardrail sections which overlap with each other and adjoin with each other by means of internal contact surfaces, wherein the mounting openings correspond to each other and substantially coincide with each other, wherein the transverse through hole of the bolt is located at the side of the guardrail sections which overlap with each other, opposite relative to the resisting head, and a locking cotter which is disposed in a transverse through hole of the bolt and tightens the guardrail sections, which overlap with each other, against the resisting head of the bolt. The present invention relates also to a safety traffic barrier comprising such a cotter joint.

[0002] A safety traffic barrier is a safety device for traffic that is commonly disposed in dangerous locations for an absorption of an energy of a possible collision of a vehicle driving a road. Such a barrier constitutes also a physical obstacle that in a case of striking it by a vehicle may make a threat for health or life of traffic participants. The fundamental object of a safety traffic barrier is thus to provide a protection of health and life of traffic participants and providing safety for persons and buildings located in road surroundings.

[0003] A typical known safety traffic barrier comprises a number of substantially vertical posts fixed to the ground and a number of substantially horizontal shape guardrails mounted on the posts.

[0004] Guardrails are comprised of a number of sections connected with each other by inserting end sections of adjacent guardrail sections one into another and typically screwing them together in the area of these end sections.

[0005] In many cases a necessity of a quick disassembling of a fragment of a safety traffic barrier guardrail appears in order to enable driving across the barrier by vehicles of different types. Such a situation occurs for example in a case of a road accident which requires a crossing through a safety traffic barrier to be made accessible quickly for vehicles of rescue or emergency service.

[0006] A disassembly of screw connections is complicated and time-consuming. Therefore in the prior art, alternative connections of adjacent guardrail sections of a safety road barrier distributed along the barrier have been proposed providing a quick disassembly functionality of a safety traffic barrier.

[0007] A typical solution of this kind is a cotter joint constructed using typical longitudinal mounting openings formed in guardrail shapes and typically designed for screw connections with connecting screws. Such known cotter joints comprise bolts with transverse openings passed through typical mounting openings of guardrail sections originally designed for mounting screws, wherein locking cotters are driven into the bolt transverse openings thus clamping the connected end sections of guardrails between them and resisting heads of the bolts. A strength of such known cotter joints proves however to be considerably lower than a strength of screw connections and in many cases may be insufficient for ensuring a required safety level, what may in turn result in a health hazard for traffic participants.

[0008] The object of the present invention has been to provide a cotter joint of a guardrail sections of a safety traffic barrier featuring increased strength and durability as well as a simple and cost-effective construction enabling quick disassembling of such a joint.

[0009] In order to accomplish the aforementioned and other objects, according to the present invention it is provided a cotter joint of guardrail sections of a safety traffic barrier as defined in the outset which is characterized in that the bolt has a cross-section substantially corresponding to the cross-section of the mounting opening of the guardrail sections, and at least one reinforcing plate is mounted on each external non-contact surface of connecting end sections of the guardrail sections which overlap with each other, wherein the reinforcing plate is provided with at least one through hole substantially coincided with the at least one mounting opening of the guardrail section to which this reinforcing plate is mounted.

[0010] According to the present invention it is preferable that the cross-section of the bolt is substantially precisely matched to the cross-section of the mounting opening of the guardrail section and thus matched to the cross-section of the through hole of the reinforcing plate, in particular matched in such a manner that for the coaxial positioning the bolt in these openings/holes a distance between an external surface of the bolt and an internal surface of these openings/holes in any arbitrary point does not exceed 5 mm, and most preferably 3 mm.

[0011] The thickness of the reinforcing plate is preferably at least the same as the thickness of the guardrail section wall, and preferably the thickness of the reinforcing plate amounts at least twice the thickness of the guardrail section wall.

[0012] The cross-section of the bolt and the cross-section of the mounting openings of the guardrail sections have preferably a rectangular shape with rounded corners and the longitudinal axis parallel relative to the longitudinal axis of the guardrail.

[0013] The reinforcing plates are preferably welded, the most preferably on the whole perimeter thereof, to the guardrail sections.

[0014] Some preferred embodiments of the cotter joint according to the present invention comprise three bolts, preferably arranged along a straight line parallel relative to the longitudinal axis of the guardrail, cooperating with three locking cotters.

[0015] The bolt of the cotter joint of the present invention has preferably a tapered end section formed on the

bolt end opposite relative to the resisting head.

[0016] According to the present invention, it is also provided a safety traffic barrier comprising at least two vertical posts on which at least one substantially horizontal guardrail comprised of at least two sections is mounted, wherein the barrier is characterized in that the at least two sections of the guardrail are connected with each other by means of the cotter joint according to the present invention.

[0017] The exemplary embodiment of the present invention is presented below in connection with the attached drawings on which:

Fig. 1 presents an exploded view of a first embodiment of a cotter joint of guardrail sections of a safety traffic barrier according to the present invention;
Figs. 2, 3 present cross-sections of the first embodiment of the cotter joint according to the present invention of Fig. 1;
Figs. 4-6 present views of an exemplary bolt of a cotter joint according to the present invention employed in the cotter joint of Figs. 1-3; and
Figs. 7-8 present views of an exemplary locking cotter of a cotter joint according to the present invention employed in the cotter joint of Figs. 1-3;
Figs. 9 and 10 present respectively side view and top view of an exemplary safety traffic barrier in which the second embodiment of a cotter joint according to the present invention is employed;
Figs. 11-12 and 13 present the barrier of Figs. 10 and 11 seen in the directions W and Z, respectively;
Fig. 14 presents an exploded view of a fragment of a safety traffic barrier comprising the second embodiment of a cotter joint according to the present invention;
Figs. 15-16 and 17-18 present results of practical crash tests carried out for an exemplary cotter joint according to the present invention and for a comparative typical screw connection corresponding to this cotter joint; and
Fig. 19 illustrates another embodiment of a bolt of a cotter joint according to the present invention in a bottom view (Fig. 19a), side view (Fig. 19b), and front view (Fig. 19c).

[0018] Numerical references of elements performing the same functions remain the same in all figures of the drawing, wherein suffixes (a, b, c) were added, where appropriate, to additionally distinct elements having the same functionality but different construction.

[0019] The first embodiment 1a of a cotter joint of a guardrail 2 sections 21 of a safety traffic barrier as presented in Fig. 1 is a one-point connection.

[0020] The sections 21 of the guardrail 2 have a form of a three-wall shape comprising two end walls 211 parallel to each other and connected with a transverse wall 212.

[0021] The guardrail 2 is mounted on posts (not shown) by means of a bottom end wall 211 in which mounting openings (not shown) are formed for inserting appropriate connecting screws fixing the guardrail to the posts.

[0022] Connecting end sections 22 of the adjoining sections 21 of the guardrail 2 overlap with each other and adjoin with each other by means of internal contact surfaces 221.

[0023] Mounting openings 223 are formed in the connecting end sections 22 of the guardrail 2 sections 21 for creating a cotter joint 1 according to the present invention.

[0024] The mounting openings 223 are elongated along the longitudinal axis O1 of the guardrail 2 and have a rectangular shape, the shorter sides of which perpendicular relative to the longitudinal axis O1 of the guardrail 2, transform into semicircle sections.

[0025] Reinforcing plates 224 are mounted on external non-contact surfaces 222 of the connecting end sections 22 of the guardrail 2 sections 21 which overlap with each other, in the area of bottom end walls 211, wherein the reinforcing plates 224 have through holes 225 coincided with the mounting openings 223 of the guardrail 2 sections 21. The reinforcing plates 224 are over the whole their perimeters fixed to the bottom end walls 211 of the guardrail 2 section 21 profiles by means of peripheral welded joints 226. The thickness G1 of the reinforcing plate 224 amounts in this example twice the thickness G2 of the guardrail 2 section 21 profile wall, wherein according to the present invention it is sufficient that the thickness G1 of the reinforcing plate 224 is at least equal to the thickness G2 of the guardrail 2 section 21 profile wall.

[0026] The mounting openings 223 of the cotter joint 1 of the both sections 21 of the guardrail 2 substantially coincide with each other forming, together with the through holes 225 of the reinforcing plates 224, a through channel into which the bolt 3 having a resisting head 31 is inserted from the side of transverse walls 212 of the guardrail 2 section 21 profiles, wherein the resisting head 31 is leaned with its resisting surface 311 against the reinforcing plate 224 disposed at the side of the transverse wall 212.

[0027] The bolt 3 has a form of a rectangular plate of a cross-section corresponding to a cross-section of the mounting openings 223 of the connecting end sections 22 of the guardrail 2 section 21, and corresponding to a cross-section of the through holes 225 of the reinforcing plates 224. A cross-section of the bolt is according to the present invention substantially precisely matched to the cross-section of the openings/holes 223, 225, and a maximal distance between an external surface of the bolt 3 arranged in a coaxial manner in the openings/holes 223, 225 and an internal surface of these openings/holes in any arbitrary point, does not exceed 5 mm, and preferably 3 mm. In the presented embodiment, the maximal distances T2 between the bolt 3 surface and the opening/hole 223, 225 surfaces in points located on the longitudinal axis of the bolt 3 cross-section, are in the range of 2-3 mm, whereas the minimal distances T1 between

the bolt 3 surface and the opening/hole 223, 225 surfaces existing in points located on longitudinal sides of a rectangular part of the bolt 3 cross-section, are in the range 1-1.5 mm (cf. Fig. 5).

[0028] The resisting surface 311 has a shape similar to the shape of the bolt 3 cross-section defined by an edge constituting an envelope curve shifted from this cross-section by a distance approximately equal to the thickness of the bolt 3 plate. Generally, the resisting surface 311 is substantially perpendicular relative to the longitudinal axis O2 of the bolt 3, wherein in this specific embodiment the resisting surface 311 is slightly angled radially outward relative to the plane perpendicular relative to the longitudinal axis O2 of the bolt 3 into the resisting head 31 by an angle β amounting in this embodiment 6°.

[0029] A transverse through hole 32 for the locking cotter 4 is formed in the bolt 3. The through hole 32 of the bolt 3 extends along the longitudinal axis O3 oriented nonparallelly, in particular transversely, relative to the longitudinal axis O2 of the bolt 3 and transversely relative to the longitudinal axis O1 of the guardrail 2. Both the locking cotter 4 as well as the transverse through hole 32 have rectangular shapes, the longitudinal axes of which substantially coincide with the longitudinal axis O2 of the bolt 3 and are transverse relative to the longitudinal axis O1 of the guardrail 2, wherein the width S1 of the locking cotter 4 is slightly smaller that the width S2 of the transverse through hole 32 of the bolt 3. The locking bolt 4 has a form of a plate of a right trapezoid shape, wherein the longitudinal side surfaces of the plate slanted relative to each other by an angle α constitute cottering resisting surfaces 43. An exemplary angle α of a slant of the cottering surfaces 43 relative to each other amounts in this exemplary embodiment 7°. Internal edges of the transverse through hole 32 are beveled with an angle γ which in this embodiment amounts 9°. After an insertion of the bolt 3 into the mounting openings 223 of the connecting end sections 22 of the guardrail 2 sections 21 and leaning the resisting head 31 against the guardrail 2, the transverse through hole 32 of the bolt 3 is located at the side of the end sections 22 of the guardrail 2 sections 21 which overlap with each other, opposite relative to the resisting head 31. In order to ensure a good tightening of the connected guardrail 2 sections 21 to each other by means of the locking cotter 4, the transverse through hole 32 of the bolt 3 is also partially located in the volume of the reinforcing plate 224 located at the side of this hole, or in another examples it may even reach deeper into the connecting end sections 22 which overlap with each other. In other words, a distance D1 of the internal edge of the transverse through hole 32 of the bolt 3 from the resisting surface of the resisting head 31 of the bolt is smaller than a total thickness of the elements which are to be clamped between the locking cotter 4 and the resisting head 31. In the case presented in Figs. 1-3, such a total thickness comprises two thicknesses G2 of the bottom end walls 211 of the guardrail 2 sections 21 and two thicknesses G1 of the reinforcing plates 224. Thanks to that, after driving the locking cotter 4 down, the external cottering surface 43 of the cotter 4 is leaned against the external edge of the transverse through hole 32 of the bolt 3, and the internal cottering surface 43 of the cotter 4 is leaned against the reinforcing plate 224 welded to the surface of the guardrail 2 section 21 (and not against the internal edge of the transverse through hole 32 of the bolt 3), ensuring a proper tightening the connecting end section 22 of the guardrail 2 sections 21 to each other and to the resisting head 31 of the bolt 3. Obviously, it is best to insert the locking cotter 4, as presented in the drawings, into the transverse through hole 32 of the bolt 3 from above in the direction of gravitational force. Such a direction of the locking cotter 4 insertion is preferable considering an assembling simplicity, but it also prevents against accidental unintentional loosening or even knocking out the cotter, the probability of which is the greatest in a case of an action of a force from the barrier top side to which an access is the easiest. Alternatively however, it is also possible to drive the locking cotter 4 down equally well by moving it from below through the bolt 3 in opposite direction relative to the direction of gravitational force, such as for example in a case of having a good access to the transverse through hole 32 of the bolt only from below of the bolt 3.

[0030] The locking cotters 4 are preferably provided with lines 41 and handles 42, by means of which the cotters may be fixedly connected to a safety traffic barrier, what prevents a loss thereof after a barrier disassembly.

[0031] Figures Figs. 9-14 present a fragment of a double safety traffic barrier 5 featuring a quick disassembly functionality, in which the second embodiment of the cotter joint 1b according to the present invention is employed. The barrier 5 comprises two guardrails 2 parallel to each other, having a B-profile and fastened opposite each other on the opposite sides of the vertical posts 6 having forms of sigmoid cross-section profiles. The posts 6 are mounted in appropriate sleeves 63 fixed to the ground.

[0032] The guardrails 2 are comprised of a number of shape sections 21, wherein the sections 2 adjacent to each other overlap with each other by inserting a connecting end section 22 of one section 21 into a connecting end section 22 of the adjacent section 21 corresponding thereto.

[0033] The B-profile of the guardrail 2 section 21 comprises two end walls 211 parallel relative to each other and coplanar relative to each other, and a central wall 213 parallel to the end walls 211 and transforming at both longitudinal sides thereof into two transverse walls 212 connecting this central wall 213 to the end walls 211. The end walls 211 are provided with edge turnings formed along the free internal edges thereof and projected toward the central wall 213

[0034] The guardrails 2 are oriented with their end walls 211 facing outward in the direction out from the posts 6, and the central walls 213 of the guardrails 2 are

located at the internal side and serve for fastening the guardrails 2 to the posts 6.

[0035] In the barrier 5, the cotter joints 1b serve for connecting the adjacent guardrail 2 sections 21 with each other as well as for connecting the guardrail 2 to the posts 6.

[0036] This cotter joint 1b of the adjacent guardrail 2 sections 21 constitutes the base cotter joint 1a shown in Figs. 1-3, but implemented as multiplied three times and located in the areas of the central walls 213 of the guardrail 2 sections 21. The cotter joint 1a of Figs. 1-3 may be termed as a one-point connection, whereas the cotter joint 1b of Figs. 9-14 may be termed as a three-point connection.

[0037] Three longitudinal mounting openings 223 are formed in each connecting end section 22 of the guardrail 2 sections 21 in the central walls 213, wherein the longitudinal axes of the mounting openings 223 are collinear and parallel relative to the longitudinal axis of the guardrail 2. In each section 21 of the guardrail 2, each mounting openings 223 transforms at the non-contact side 222 into the through hole 225, which coincides therewith and has the same cross-section shape and is formed in the reinforcing plate 224. The reinforcing plates 224 are fixed on the non-contact surfaces 222 of the central walls 213 of the sections 21 of the guardrails by means of peripheral welded joints 226. In this embodiment, the thickness of the reinforcing plates 224 amounts twice the thickness of the guardrail 2 profile wall.

[0038] The cotter joint 1b of the adjacent sections 21 of the guardrail 2 in the barrier 5 are constructed in an analogical manner as the cotter joint 1a depicted in Figs. 1-3. After an insertion of the connecting sections 22 in a manner enabling a coincidence of the mounting openings 223 and the through holes 225 of the connected sections 21 of the guardrail 2 with each other, the bolts 3 are inserted into all three through channels formed by these openings/holes 223, 225. The insertion is effected from the external side, i.e. from the side of the end walls toward the posts 6. After an insertion of the bolts 3, the locking cotters 4 are driven down into the transverse through holes 32 of the bolts 3.

[0039] Additionally, the central arrangement of the bolt 3 and the locking cotter 4 is used for fastening the guardrail 2 to the post 6 of the barrier 5 in the following manner. Double brackets 61 are mounted on the posts 6 and the guardrails 2 are mounted on the posts 6. The bracket 61 has a form of a C-shaped profile, which is arranged perpendicularly relative to the longitudinal axis of the post 6 and perpendicularly relative to the longitudinal axis of the guardrails 2, i.e. it is arranged horizontally and transversely relative to a line of the barrier 5. The bracket 61 is fastened to the post by means of a connection clip 62 having a form of a semi-closed channel section. The arms of the connection clip 62 are screwed to the post 6 profile arms, and the bracket 61 is in turn screwed to the web of the connection clip 62. The bracket 61 comprises connecting walls 611, which adjoin the internal reinforcing plates 224 and are provided with through holes, which coincide with the central channels formed by the mounting openings 223 and the through holes 225 of the guardrail 2 sections 21, which overlap with each other. Thanks to that, the inserted bolts 3 extend also through the through holes 612 of the connecting walls 611 of the bracket 61, thus making an access to the transverse through hole 32 of the bolt 3 at the internal side of the connecting walls 611. Therefore an insertion of the locking bolts 4 in the transverse through holes 32 of the bolts 3 results concurrently in tightening the connected sections 21 of the guardrail 2 to each other and fastening the sections on the bracket 61. As the connecting walls 611 are situated between the arms 613 of the bracket 61 profile, appropriate through holes 614 coincided with the transverse through holes 32 of the bolts 3 have to be formed in the connecting walls 611, in order to enable an insertion of the locking cotters 4. The arms 613 of the bracket 61 C-shaped profile are protruded on both sides thereof outside the web, thus forming tensioning protrusions 615 supporting the end walls 211 of the guardrails and increasing the guardrails 2 stiffness.

[0040] In the barrier 5, the one-point cotter joint 1a' according to the present invention, as presented in Figs. 1-3, is used for connecting the guardrail 2 sections 21 in central parts of the sections 21 to the posts 6. This connection constitutes the middle part of the three-point cotter joint 1b with the bracket 61.

[0041] As presented in the drawing, it is preferable that all cotters 4 employed in the cotter joints 1b, 1a' are fastened to the barrier 5 by means of lines 41 fixed to handles 42 which are screwed down to the brackets 61, what prevents a loss of the cotters 4 after a disassembly of the cotter joints 1 to disassembly the barrier 5.

[0042] Another preferred embodiment of a bolt 3c of a cotter joint according to the present invention is illustrated in Figs. 19a-c. The bolt 3c is provided with a tapered end section 33 on the bolt 3c end opposite relative to the resisting head 31. In this embodiment, the tapered end section 33 is formed by chamfering of the bolt 3c end in the plane perpendicular relative to the longitudinal axis O3 of the bolt 3c transverse through hole 32. The tapered end section 33 facilitates inserting the bolt 3c into respective openings/holes as required by the present invention, and thus facilitates assembling and disassembling of the cotter joint of the present invention.

[0043] For the cotter joint 1b of the guardrail section of the safety traffic barrier according to the present invention as presented in Figs. 9-14, practical crash tests have been performed in the accredited laboratory facility Aisico (http://www.aisico.it).

[0044] The crash tests have been carried out for comparing strength to dynamic loads of two types of connections of guardrail sections of a so-called B-profile: a three-point cotter joint according to the present invention (test ST376) and a typical six-point screw connection (comparative test ST377).

[0045] The guardrails with the tested connections have

been mounted on posts of C-shaped cross-section having the following dimensions: 120x80x40x5 mm.

[0046] The test have been carried out using an appropriately ballasted trolley provided with a head forming an element apt for striking a guardrail directly.

[0047] An energy of a trolley needed to obtain a required collision energy has been calculated using Excel software macrocommands considering a rolling resistance of the trolley wheel in guiding tracks.

[0048] A verification of a real level of a collision energy affecting a tested guardrail has been based on velocity measurements using a system of photocells arranged in the vicinity of a crash zone and connected to a chronometer TAG Heuer PTB605.

[0049] In both tests ST376 and ST377, the same crash parameters have been used:

- the trolley mass: 2163 kg;
- the real crash velocity: 10.9 km/h;
- the theoretical crash energy: 10.0 kJ;
- the real crash energy: 9.93 kJ.

[0050] The results of the crash tests are graphically represented in the photos depicting the tested connections before and after a crash denoted respectively as Figs.15 and 16 for the test ST376 of the cotter joint according to the present invention and as Figs. 17 and 18 for the comparative test ST376 of a typical screw connection.

[0051] It is clearly visible when comparing the photos that damages (breakages) of a guardrail are substantially the same for both connection types, and in the both tests they are located outside the connection areas. The obtained results evidence that the cotter joint having a quick disassembly functionality according to the present invention, unexpectedly features at least the same strength as a typical screw connection, a quick disassembly of which is impossible. Thanks to that, a decrease of a crash performance of the barrier according to the present invention does not occur on the sections featuring a quick disassembly functionality.

[0052] The figures are not necessarily to scale, and some features may be exaggerated or minimized, in order to provide better an invention illustration. These and other factors however should not be considered as limiting the spirit of the invention, the intended scope of protection of which is indicated in the appended claims. Therefore the presented embodiments should not be regarded as limiting the scope of protection defined in the patent claims.

List of reference numerals

[0053]

1. cotter joint (1a, 1b)
2. guardrail
    21. section (of the guardrail 21)
        211. end wall
        212. transverse wall
        213. central wall
    22. connecting end section (of the guardrail section 21)
        221. contact surface
        222. non-contact surface
        223. mounting opening (of the section 21 of the guardrail 2)
        224. reinforcing plate
        225. through hole (of the reinforcing plate 224)
        226. weld
3. bolt
    31. resisting head
    311. resisting surface
    32. transverse through hole
    33. tapered end section
4. locking cotter
    41. line
    42. handle (of the line 41)
    43. cottering surface
5. safety traffic barrier
6. post (of the barrier 5)
    61. bracket
        611. connecting wall
        612. through hole (of the connecting wall 611)
        613. arm (of the bracket profile 61)
        614. through hole (of the arm 613)
        615. tensioning protrusion
    62. connection clip
    63. mounting sleeve

Claims

1. A cotter joint (1) of guardrail (2) sections (21) of a safety traffic barrier (5) comprising
at least one bolt (3) having a transverse through hole (32) of a longitudinal axis (O3), nonparallel relative to the longitudinal axis (O2) of the bolt (3), and a resisting head (31), wherein the bolt (3) extends through mounting openings (223) of the connecting end sections (22) of the guardrail (2) sections (21) which overlap with each other and adjoin with each

other with their internal contact surfaces (221), wherein the mounting openings (223) correspond and substantially coincide with each other, wherein said transverse through hole (32) of the bolt (3) is located at the side of said guardrail (2) sections (21) which overlap with each other, which is opposite relative to the resisting head (31), and
a locking cotter (4) which is disposed in said transverse through hole (32) of the bolt (3) and tightens said guardrail (2) sections (21), which overlap with each other, against the resisting head (31) of the bolt (3),
characterized in that
said bolt (3) has a cross-section substantially corresponding to the cross-section of the mounting openings (223) of the guardrail (2) sections (21), wherein at least one reinforcing plate (224) is mounted on each external non-contact surface (222) of said connecting end sections (22) of said guardrail (2) sections (21) which overlap with each other, wherein said reinforcing plate (224) is provided with at least one through hole (225) that substantially coincides with the at least one mounting opening (223) of the guardrail (2) section (21) to which this reinforcing plate (224) is mounted.

2. The cotter joint (1) according to Claim 1, **characterized in that** the thickness (G1) of the reinforcing plate (224) is at least the same as the thickness (G2) of the guardrail (2) section (21) wall, and preferably the thickness (G1) of the reinforcing plate (224) amounts at least twice the thickness (G2) of the guardrail (2) section (21) wall.

3. The cotter joint (1) according to Claim 1 or 2, **characterized in that** the cross-section of the bolt (3) and the cross-section of the mounting openings (223) of the guardrail (2) sections (21) have a rectangular shape with rounded corners and the longitudinal axis parallel relative to the longitudinal axis (O1) of the guardrail (2).

4. The cotter joint (1) according to Claim 1 or 2 or 3, **characterized in that** the reinforcing plates (224) are welded, preferably over the whole perimeter thereof, to the guardrail (2) sections (21).

5. The cotter joint (1) according to any one of Claims 1-4, **characterized in that** it comprises three bolts (3) cooperating with three locking cotters (4), wherein these bolts (3) are preferably arranged along a straight line parallel relative to the longitudinal axis (O1) of the guardrail (2).

6. The cotter joint (1) according to any one of Claims 1 -5, **characterized in that** the bolt (3) has a tapered end section (33) formed on the bolt (3) end opposite relative to the resisting head (31).

7. A safety traffic barrier (5) comprising at least two vertical posts (6) on which at least one substantially horizontal guardrail (2) comprised of at least two sections (21) is mounted, **characterized in that** the at least two sections (21) of the guardrail (2) are connected with each other by means of the cotter joint (1) as defined in any one of Claims 1-6.

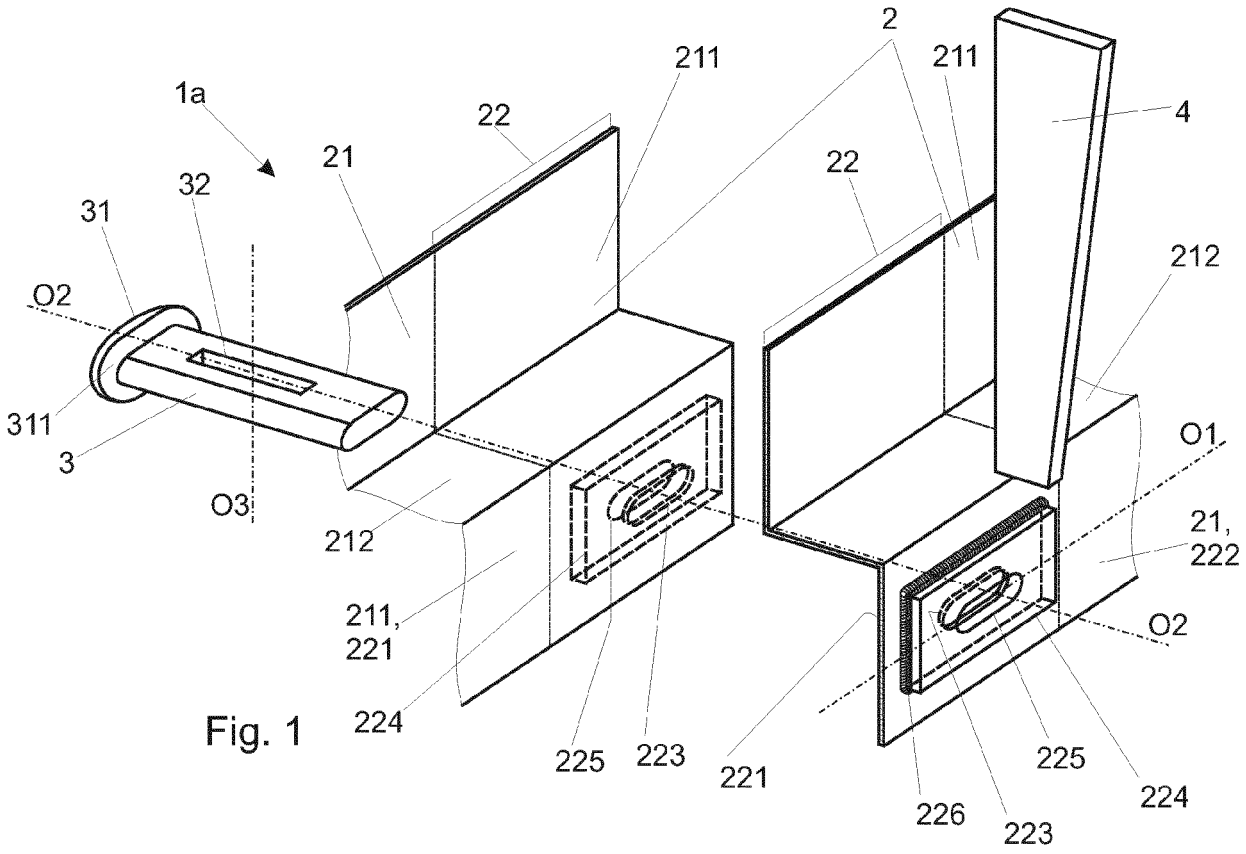


Fig. 1

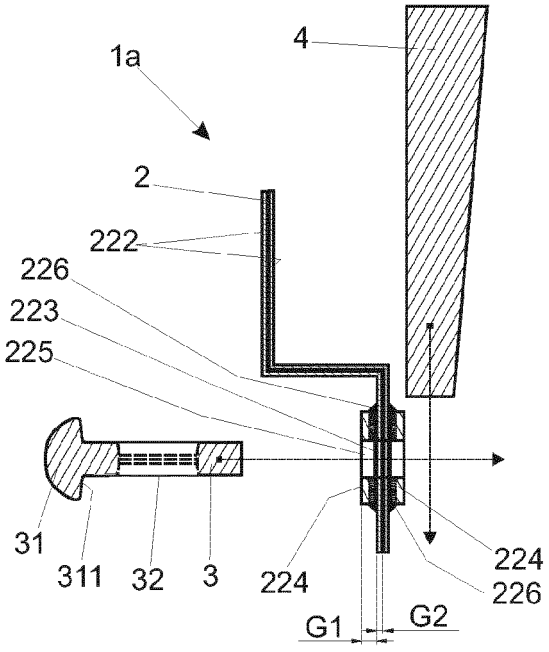


Fig. 2

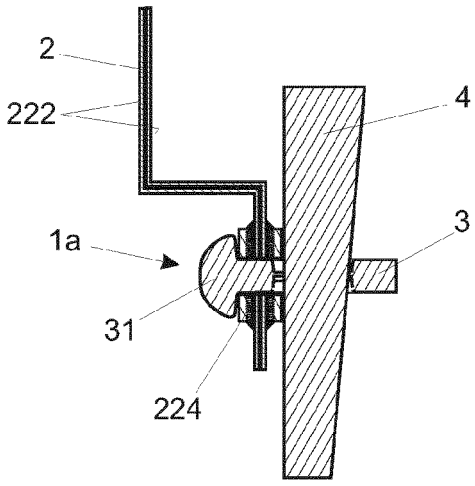
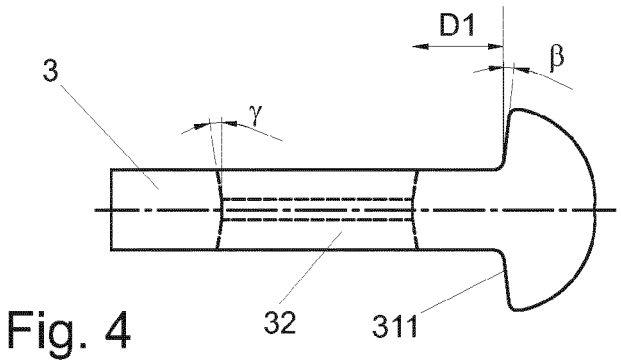


Fig. 3



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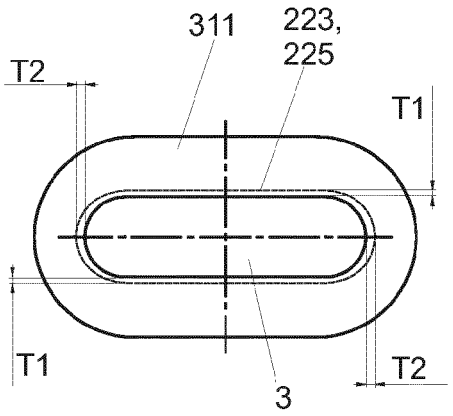

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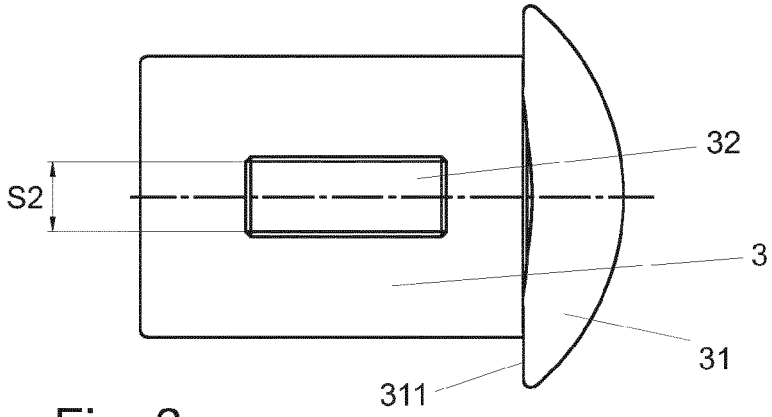

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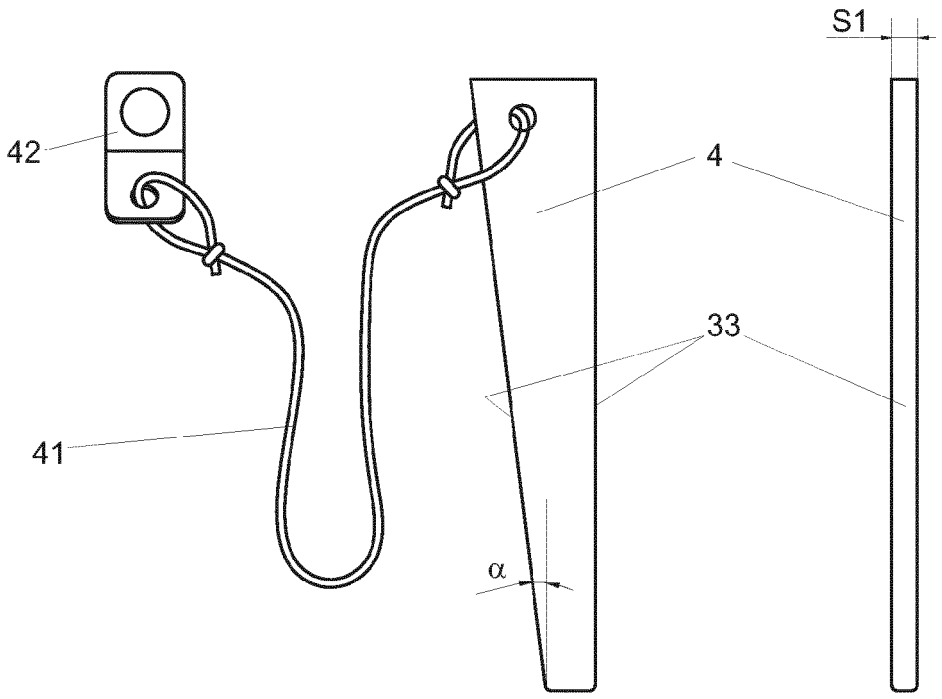
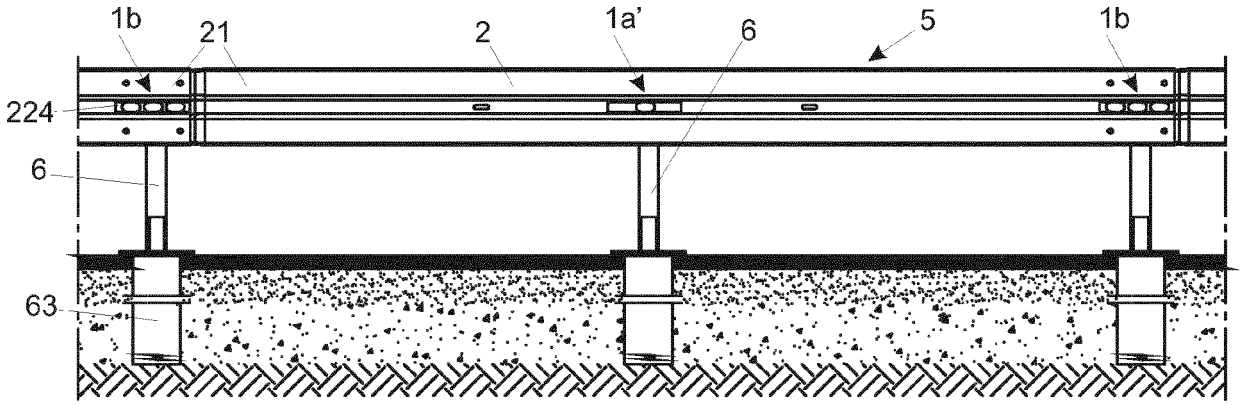


Fig. 7

Fig. 8



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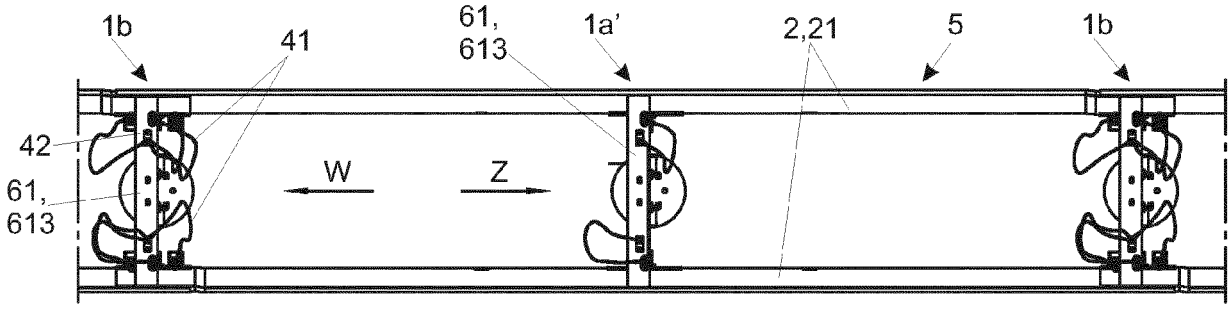

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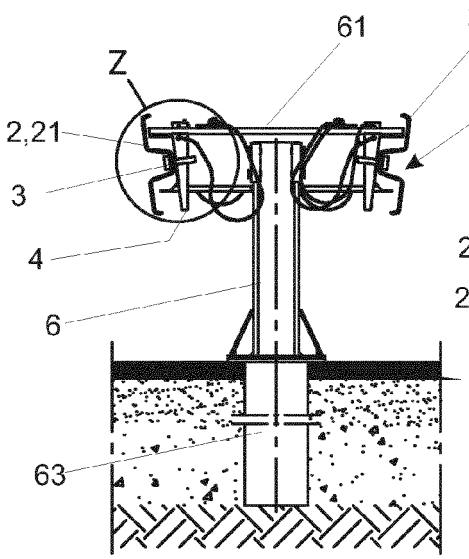

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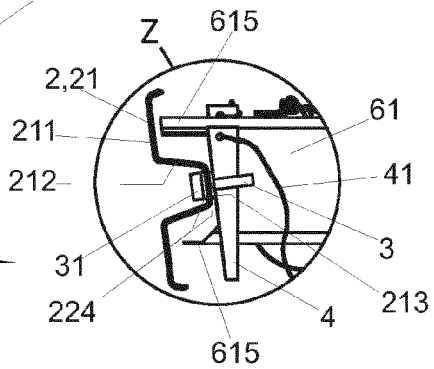

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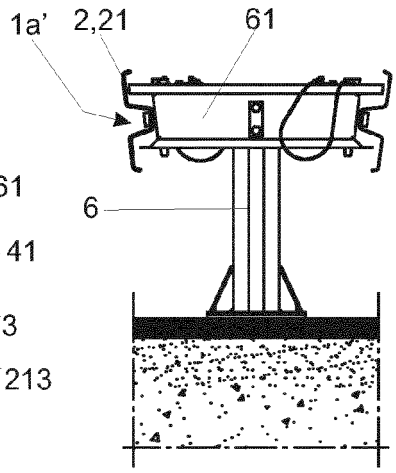

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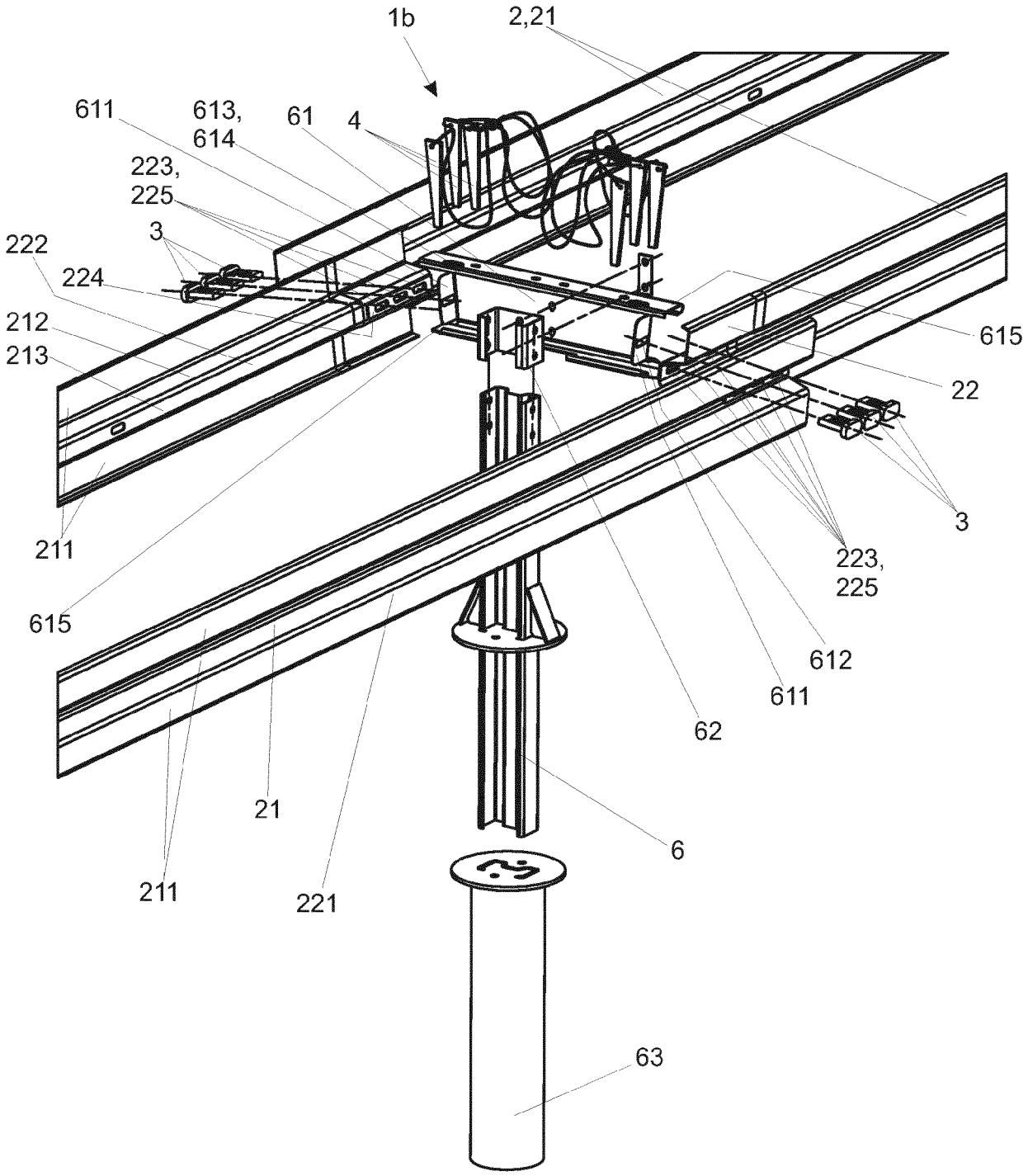
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Fig. 14

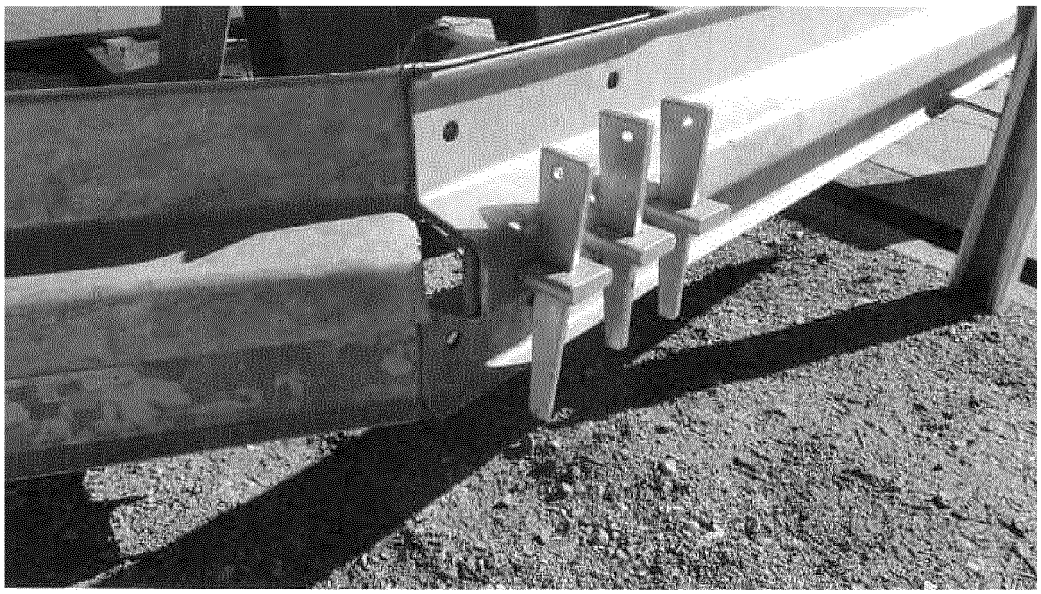

Fig. 15

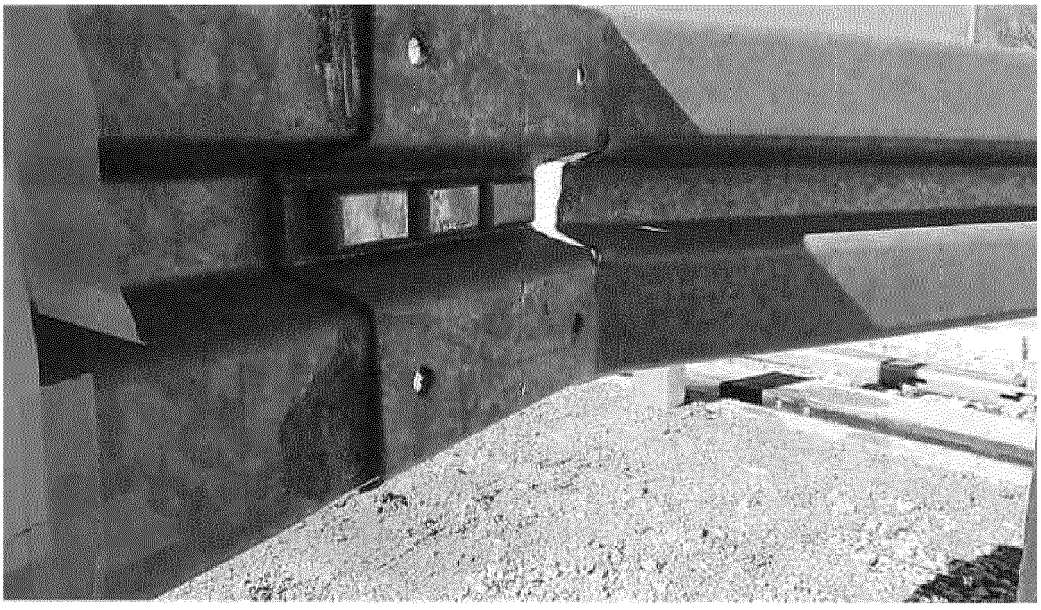

Fig. 16

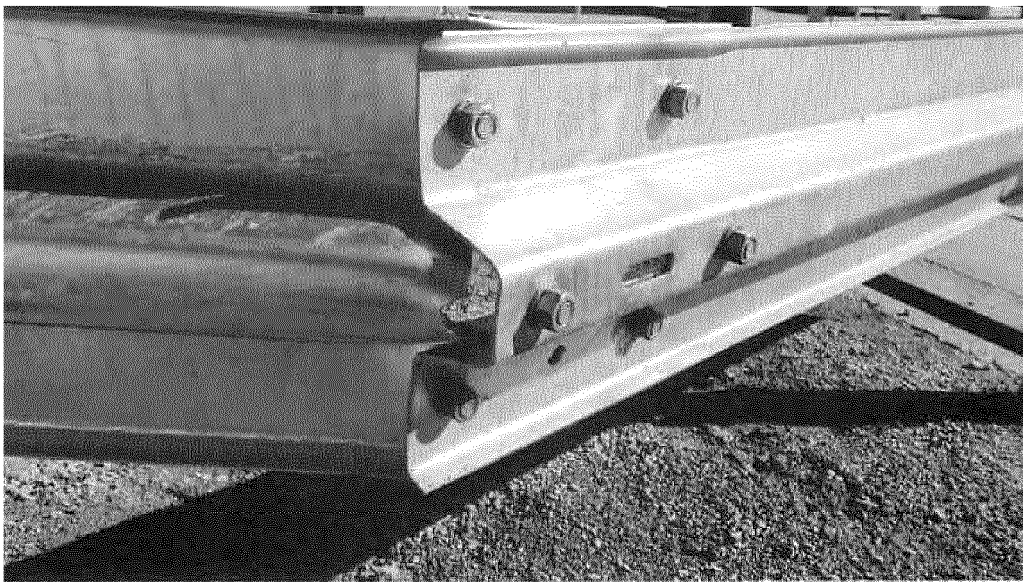

Fig. 17

Fig. 18

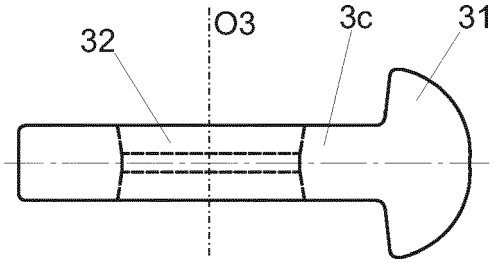

Fig. 19a

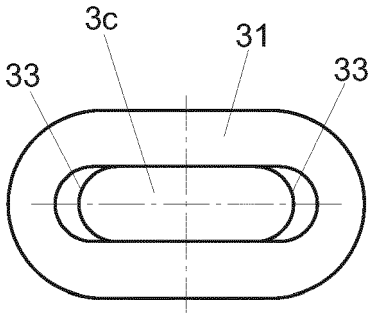

Fig. 19c

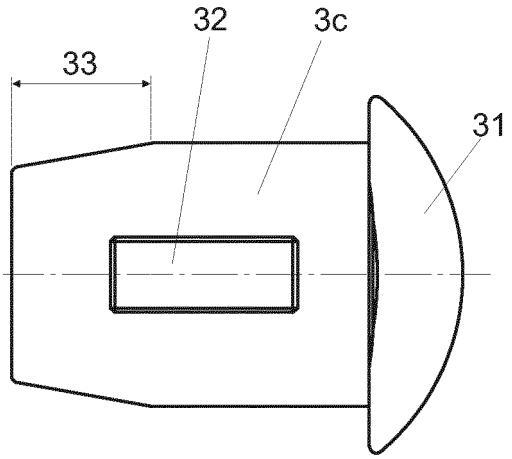

Fig. 19b

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 7830

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 June 2019	Stern, Claudio

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