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(54) ROAD SAFETY BARRIER

(57) The road safety barrier is intended to enhance the security and safety of means of transport moving on the roadway side of public roads.

It consists of a set of supporting posts (1), constructed from metal pipes filled with an appropriate amount of concrete (6) up to the free end and anchored by a base plate (2) in the road shoulder, a rail (4) for each pair of posts, and a collar-damper-spacer assembly composed of two cylinders (7) and (8), one placed inside the other and positioned in an eccentric manner to the maximum, in contact, tangent, and welded together by an internal weld seam. An additional cylinder (12) is welded to the outer cylinder (7) by another weld seam, with the wall cut along the generatrices and two flanges forming a collar that attaches to the supporting post (1) of the barrier using bolt and nut assemblies (13). The outer cylinder (7) also features holes through which additional bolt and nut assemblies (14) pass, securing one end of each rail (4) to the collar- damper-spacer assembly fixed to each supporting post (1) of the road safety barrier.

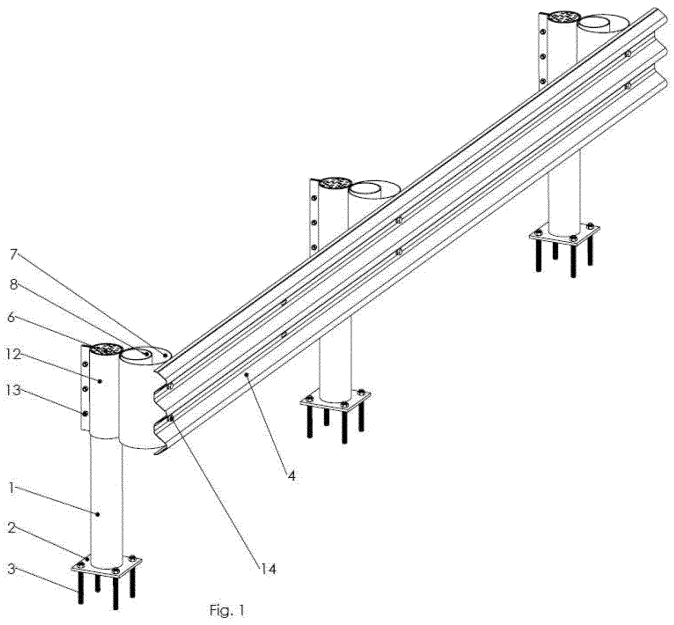

Fig. 1

Fig.1

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Description

[0001] The invention pertains to a road safety barrier intended to be supplemented with means for ensuring the safety and integrity of vehicles moving on the roadway side of public roads. Generally, to prevent vehicles involved in accidents from leaving the roadway, various objects or assemblies of objects functioning as safety barriers are provided. The barrier must be robust enough to stop the vehicle while simultaneously being sufficiently elastic to absorb the impact shock through the deformation of the barrier without significantly deforming the vehicle, thereby ensuring maximum protection for the occupants inside.

[0002] To mitigate the consequences of accidental vehicle departures from the roadway, barriers are used that consist of an assembly of individual units. These units are primarily composed of a post, a spacer/damper, and a rail.

[0003] A high-impact resistance safety barrier is known, designed to withstand collisions with any vehicle. Generally, the posts are constructed from heavy metal profiles with high impact resistance, such as HEA or HEB profiles, I profiles, C profiles, OMEGA profiles, and so on. The solution presents the disadvantage of a complex construction, high metal material consumption, and a risk of severe deformation upon vehicle impact.

[0004] To construct a high-impact-resistant safety barrier for any type of vehicle, an alternative solution is known which involves the use of multiple posts per unit length. Specifically, the ratio between the length of a rail, which is typically 4 meters, and the number of posts supporting it should be less than one.

[0005] In order to construct a safety barrier with high resistance to impact with any vehicle, another known solution involves the use of rails and spacers/dampers with a large thickness of the metal sheet from which these elements are made, i.e., more than 3mm in the case of rails and more than 6mm in the case of spacers/dampers.

[0006] All these solutions are very metal-intensive, i.e., the weight per linear meter of the safety barrier is high, which implies high manufacturing and commissioning costs.

[0007] A solution is also known that involves sets of prefabricated pieces made of recycled rubber, which are introduced into an infrastructure through either stacking or connecting as applicable by using an appropriate binder. The drawback of this solution is that it is complex, entails high implementation costs, and is particularly unusable during the cold season when the materials used (such as rubber) lose their elasticity and become brittle.

[0008] A known solution used as a protective barrier is applicable also to the areas adjacent to access roads, in which water is utilized as ballast for the component parts. The drawback of these barrier solutions lies in their complete ineffectiveness during the winter season when the water freezes.

[0009] The road safety barrier according to the invention consists of a set of supporting posts made of tubular profiles, fixed at one end to the roadside embankment, a cross rail for each pair of supporting posts, and a collar-damper-spacer assembly consisting of two cylinders of different diameters and different wall thicknesses. One cylinder is placed inside the other and positioned eccentrically to the maximum extent, with the interior cylinder having a greater wall thickness. These cylinders are arranged in contact tangentially and welded along one generatrix. An additional outer cylinder is added, with its wall cut along the generatrices and two flanges bent back to form a collar that attaches to the post of the barrier using bolt and nut assemblies. The outer cylinder of the damper is fixed to one end of the transverse rail. The column pipe is filled with concrete from the fixed end to the free end.

[0010] Here are some examples of the implementation of the invention in connection with Fig 1, Fig.2 and Fig.3, which illustrate:

- Fig. 1 - Road safety barrier assembly;
- Fig. 2 - Top view of the location for attaching the post rail using the collar-damper-spacer assembly;
- Fig. 3 - Axonometric view of the collar-damper-spacer assembly.

[0011] The barrier according to the invention consists of repetitive elementary portions as shown in Fig 1. It comprises a supporting post 1 made of a tubular metal profile with one end featuring a metal plate 2 that is welded, perforated at the corners, and secured to the road embankment with metal anchors 3 that penetrate through it. Additionally, it includes a rail 4 and a collar-damper-spacer assembly as illustrated in Fig.3, which connects the rail to the post.

[0012] In Figure 1, the safety barrier and its construction method are illustrated. The barrier posts 1 are positioned and secured to the roadway side using dowels 3. Subsequently, the posts 1 are filled to the free end with concrete 6 of suitable consistency for this application, such as an intermediate concrete grade C16-20, introduced using specialized transport and pumping equipment such as a concrete mixer.

[0013] The completion of post 1 through concrete filling can be carried out either on-site, on the ground, or at the manufacturing factory. This process is followed by securing the post to the road shoulder using metal dowels 3.

[0014] The collar-damper-spacer assembly, as in Fig.3, consists of two cylinders of different diameters and different wall thicknesses, designated as 7 and 8. One cylinder is placed inside the other and positioned eccentrically to the maximum extent such that the two cylinders are in contact tangentially, aligned along a generatrix. The outer cylinder 7 has thin walls, for example, 3 mm thick, while the inner cylinder 8 has thicker walls, for example, 6 mm thick. The two cylinders are welded together along their length with a weld seam 11,

executed using a conventional method such as MIG (Metal Inert Gas) - MAG (Metal Active Gas) welding with a wire diameter of 0.8-1.0 mm. The outer cylinder 7 is provided with holes 10, and diametrically opposite on the exterior of cylinder 7, in line with the contact area between the two cylinders, another cylinder 12 is welded using a separate weld seam 9 in the same manner. This additional cylinder 12, made from an open metal pipe with two flanges on the side opposite the weld, is equipped with holes and serves as a collar that allows the entire assembly to be secured to the post 1 of the safety barrier as shown in Fig.1. The assembly is firmly secured using bolt and nut assemblies 13, as illustrated in Fig.2. After completing this operation on all the posts fixed on the roadway side, the rails 4 are mounted through the holes 10 on the outer cylinders (see Fig.3) using bolts and nuts 14 as shown in Fig. 2.

[0015] In Fig.2, a top view of the pillar-collar-damper-spacer assembly with the rail 4 installed is provided.

[0016] In the case of an impact with a lightweight vehicle, for example, one with a mass of 900 kg, the mechanical shock is absorbed through the deformation of the component labeled rail 4 in Fig.1, which will undergo slight deformation. This is facilitated by the outer cylinder 7 through its deformation, representing damping stage 1. The inner cylinder 8 and the post 1 made of metal pipe remain undeformed. The vehicle will not undergo significant deformation, thereby ensuring the safety of the occupants inside.

[0017] Upon impact with a truck, for instance, one with a mass of 38,000 kg, the following sequence of deformation and energy absorption occurs: The impact will cause deformation of the rail 4, leading to complete deformation of the outer cylinder 7 (damping stage 1). The shock will then be absorbed by the inner cylinder 8, which will also undergo complete deformation (damping stage 2). Following this, the deformation will result in rotational movement by sliding through the clamping collar 12, causing the entire damper-spacer assembly to rotate around the vertical post 1 made of round pipe (damping stage 3). Subsequent to these stages, depending on the severity of the impact, the posts 1 and rails 4 will deform to ensure that the majority of the impact energy is absorbed by the road safety barrier.

Bibliographical references

[0018]

[1] Koestner Matthias, Crash barrier system with different intervals, Patent application US 2017/0081815 A1

[2] Eric Davies, Richard K. Welle, Recycled rubber barrier, Patent application US 2017/0175349 A1.

[3] Shane D. Howell, Water ballasted protection barrier array and fencing and gate assemblies for use with the same, Patent application US 2018/0223561 A1.

[4] Dean Clinton Alberson, Mark Christopher Ayton, Mohammed Talha Ghuman, Benjamin Fraser Powell, Traffic barrier with inertial crash panels and sound barrier, Patent application US 2021/0292983 A1.

[5] Pasquale IMPERO, Modular road safety barrier and an emergency openable passage, Patent application US 2023/0203767 A1.

Claims

1. Road safety barrier designed to be supplemented with means for ensuring the safety and integrity of vehicles moving on the roadway side of public roads, consisting of a set of supporting posts (1) anchored by a base plate placed at one end on the road shoulder by means of a metal support plate (2) with corner holes through which metal dowels (3) pass, a rail (4) for each pair of posts, and a collar-damper-spacer assembly, **characterized in that** the collar-damper-spacer assembly is made up of two cylinders (7), which is wider, and 8, which is narrower), one positioned inside the other and positioned in an eccentric manner to the maximum, cylinders of different thicknesses, the inner one having a greater thickness, arranged in contact tangentially and welded by an inner weld seam (11). The wall is cut along the generatrices and features two flanges forming a collar that is attached to the supporting post (1) of the barrier using bolt and nut assemblies (13). Additionally, the larger diameter cylinder (7) has several holes (10) through which further bolt and nut assemblies (14) pass, each securing one end of a rail (4) of each collar-damper-spacer assembly fixed to a supporting post (1) of the road safety barrier.

2. The road safety barrier as described in claim 1 is **characterized in that** prior to or subsequent to anchoring the supporting post to the road shoulder, the metal pipe within the construction of the post (1) is filled to its free end with a suitable amount of concrete (6) through pouring.

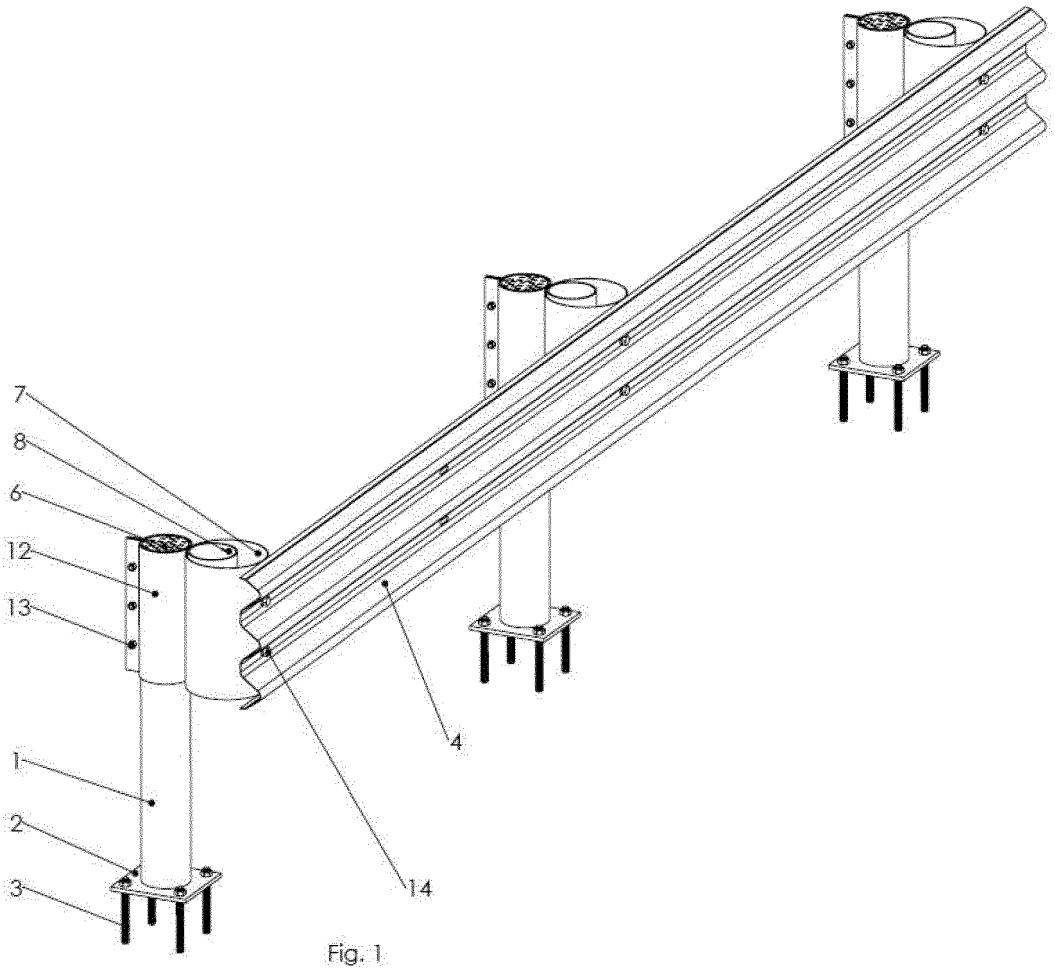

Fig. 1

Fig.1

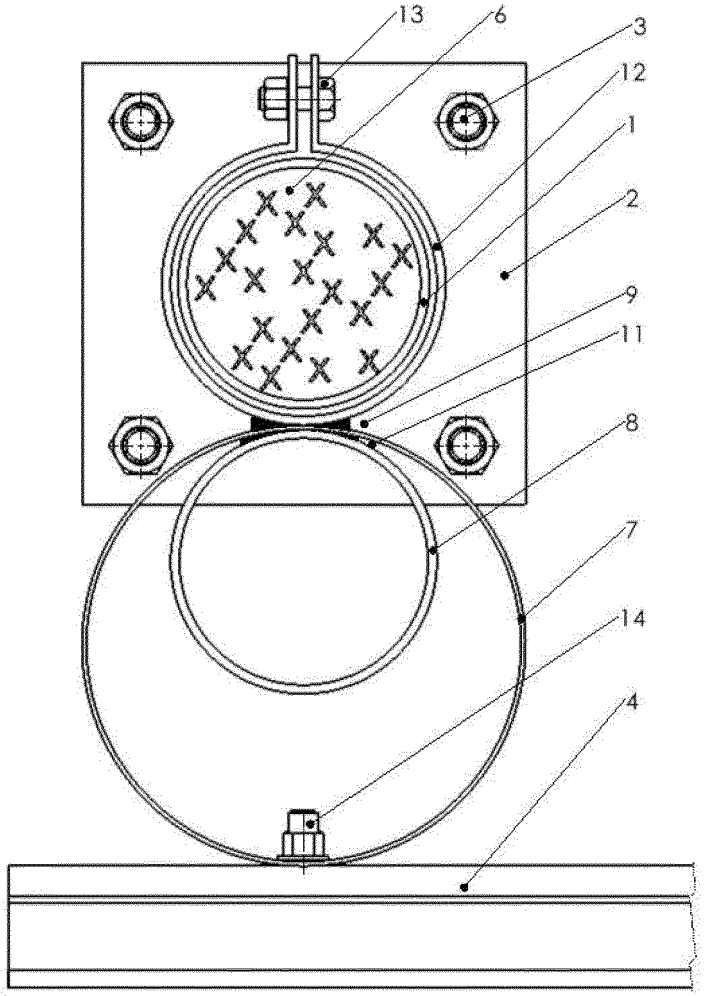

Fig.2

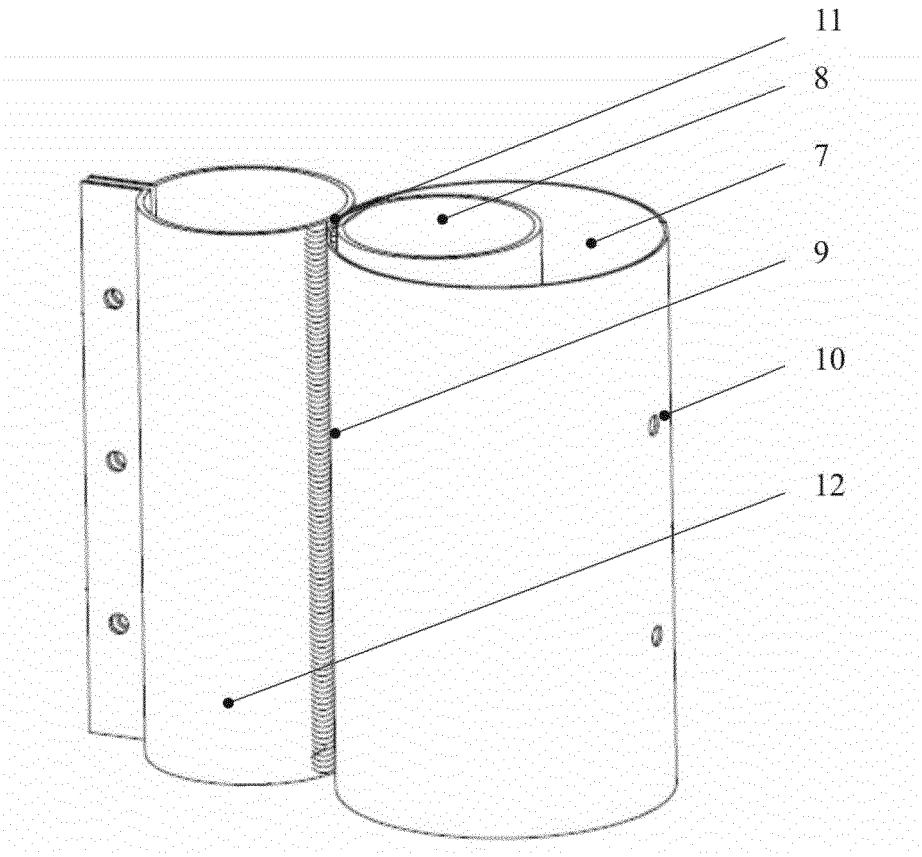

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 1115

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	DE 296 04 226 U1 (SPIG SCHUTZPLANKEN PROD GMBH [DE]) 9 May 1996 (1996-05-09) * the whole document *	1,2	INV. E01F15/04
A	EP 2 455 546 B1 (VOLKMANN & ROSSBACH GMBH & CO KG [DE]) 23 July 2014 (2014-07-23) * paragraphs [0001], [0006], [0007], [0011], [0020] - [0041] * * figures 1-12 *	1,2	
A	US 6 637 971 B1 (CARNEY III JOHN F [US] ET AL) 28 October 2003 (2003-10-28) * column 1, lines 6-13 * * column 2, lines 6-67 * * column 5, line 58 - column 6, line 18 * * figures 1,5 *	1,2	
A	US 2004/079932 A1 (HANAI ISAO [JP] ET AL) 29 April 2004 (2004-04-29) * paragraphs [0045] - [0052] * * figures 4,5 *	1,2	TECHNICAL FIELDS SEARCHED (IPC)
A	JP H06 4119 U (NONE) 18 January 1994 (1994-01-18) * paragraphs [0001] - [0003], [0011] - [0018] * * figures 1,2 *	1,2	E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 March 2025	Kremsler, Stefan

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24-03-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29604226 U1	09-05-1996	NONE	
EP 2455546 B1	23-07-2014	AU 2011328558 A1	23-05-2013
		BR 112013011413 A2	02-08-2016
		EP 2455546 A1	23-05-2012
		PL 2455546 T3	28-11-2014
		UA 105867 C2	25-06-2014
		WO 2012062415 A1	18-05-2012
		ZA 201302963 B	27-08-2014
US 6637971 B1	28-10-2003	NONE	
US 2004079932 A1	29-04-2004	NONE	
JP H064119 U	18-01-1994	NONE	

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Patent documents cited in the description

- US 20170081815 A1, Koestner Matthias **[0018]**
- US 20170175349 A1, Eric Davies, Richard K. Welle **[0018]**
- US 20180223561 A1, Shane D. Howell **[0018]**
- US 20210292983 A1, Dean Clinton Alberson, Mark Christopher Ayton, Mohammed Talha Ghuman, Benjamin Fraser Powell, **[0018]**
- US 20230203767 A1 **[0018]**