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GUARD RAIL

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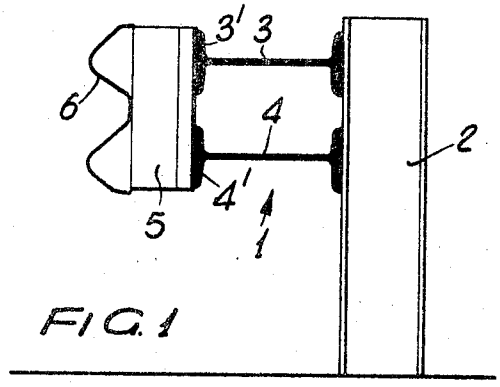


FIG. 1

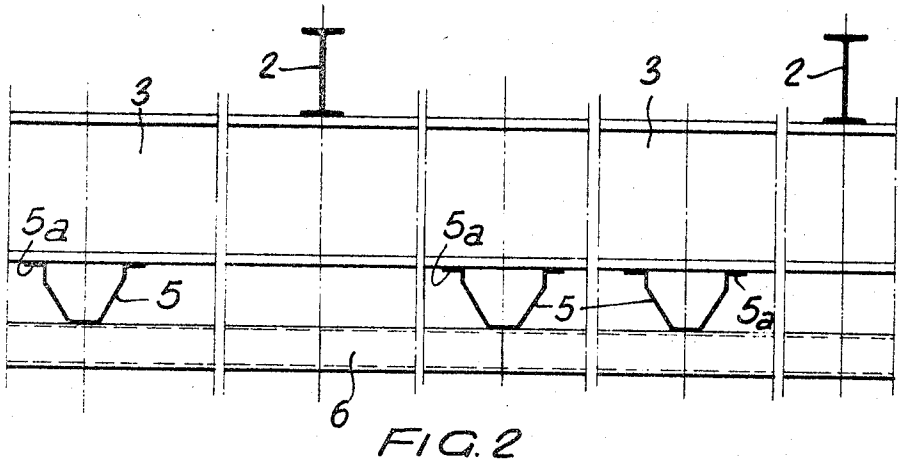


FIG. 2

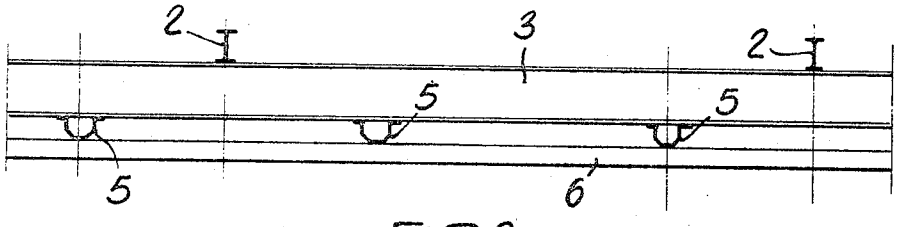


FIG. 3

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GUARD RAIL

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U.S. Cl. 256—13.1 1 Claim
Int. Cl. E01f 15/00

ABSTRACT OF THE DISCLOSURE

A guard rail is composed of a very rigid first section or stage on the edge of a highway joined to a second plastically deformable second section or stage facing the highway. When struck, the second stage deforms while absorbing impact energy, while stronger forces are resisted by the first stage so that the two stages work in series.

The present invention relates to guard rails or road barriers. In particular the present invention concerns a two-stage guard rail or road barrier, which can be arranged in correspondence with the edge of a road and in particular a motor-way.

The characteristics which a guard rail or road protection barrier of the above mentioned type must display, are mutually contrasting. In fact, on the one hand, it is necessary that the guard rail resists impacts of considerable intensity, by transmitting limited stresses, and to do this it ought to be capable of absorbing a considerable amount of work with the smallest possible value of maximum deviation and of applied maximum force. It therefore ought to have the highest possible efficiency. On the other hand, however, guard rails having high efficiency, produce excessive damage on light vehicles.

Taking into consideration only the latter consideration, the guard rail ought to have a large compliance and thus characteristics entirely contrary to those first mentioned.

Guard rails of known type have in general, tried to reach a compromise between these contrasting requirements but such compromises have shown themselves unsatisfactory in practice both for impacts by heavy vehicles and for impacts by light vehicles.

It is therefore an object of the present invention to provide a guard rail which resolves the two different problems above mentioned and eliminates the inconveniences belonging to guard rails of known type.

According to the present invention, a construction for use as a guard rail or road protection barrier comprises a highly rigid first stage arranged to be located adjacent an edge of a road carriage-way and a compliant second stage arranged to be located between the first stage and the carriage-way.

The compliant second stage operates by means of the plastic deformation of elements of the second stage which deformation permits a reaction to be obtained which changes little with variation of the deformation, thereby allowing the attainment of a deformation work value corresponding to the maximum force and deflection.

The accompanying drawings show diagrammatically by way of non-limiting example, an embodiment of the guard rail according to the present invention. More precisely:

FIGURE 1 shows a sectional view of the guard rail.

FIGURE 2 shows a top plan view of the guard rail.

FIGURE 3 shows a plan view analogous to that of FIGURE 2 but on a reduced scale.

With particular reference to the drawings, it is seen that the guard rail according to the present invention includes in its ensemble, two stages or assemblies arranged

in series, one of which, the outermost one with respect to the road, is highly rigid, while the other, the innermost one, is relatively compliant.

The highly rigid assembly is formed by a horizontal girder given the reference numeral **1** in FIGURE 1, carried by a plurality of vertical pedestals **2** suitably spaced and fixed in the ground. The girder **1** is formed by two parallel H-beams side by side, given the respective reference numerals **3** and **4**. It is to be understood, however, that said girder **1** can be realised on the basis of the present invention with any type of simple or connected sections, such as to realise a girder of suitable rigidity and yield point.

The pedestals **2** are realised in the figure by means of H-beams such as to have a suitable rigidity and limit load which are not very high.

The rigidity and the limit load of the girder, the pitch, the rigidity and the limit load of the pedestals, are proportional to the impact intensity of the heavier vehicles.

The highly rigid outermost assembly has been above described.

In series with said assembly, is disposed a relatively flexible assembly arranged more inwardly with respect to the road, and comprising a plurality of plastically deformable support elements **5**, suitably spaced from one another, and a shaped metallic ribbon **6** carried by the latter.

Each intermediate support element **5** is realised so as to provide a reaction of suitable value normal to the axis of the barrier, which value is maintained approximately constant during deformation. According to a preferred embodiment, each of the above mentioned elements is constituted by a stretch of section having a cross section substantially in the form of an isosceles trapezium having in place of its major base portion two projecting bracket parts *5a* with which the element **5** is connected to the girder **1**, or more precisely to the sections **3** and **4** which compose it. Said connection is done in any known way and is rigid. The connection between said elements **5** at their minor base portion and the shaped metallic ribbon **6**, is equally rigid.

Said metallic ribbon **6** is designed to receive the impact when a vehicle collides against the guard rail.

When a light vehicle with a limited velocity collides with the guard rail of the present invention, only the relatively flexible stage or assembly on the innermost side of the barrier, is effected; or more precisely only the shaped metallic ribbon **6** and a certain number of the elements **5** in the vicinity of the impact zone are affected.

When instead of heavy vehicle at high velocity collides against the guard rail, the metallic ribbon **6** and the elements **5** in the vicinity of the impact zone are affected first, but immediately afterwards the vehicle likewise affects the rigid girder **1** and a plurality of pedestals **2**.

From the foregoing description the advantages which the present invention offers over guard rails of known type will be clear.

The most important of said advantages are as follows:

The progressive rigidity of the assembly permits a good behaviour in the face of collisions by vehicles of very different weights arriving at the guard rail with very different velocities.

The fact that the supports (the bottom pedestals as well as the intermediate support elements of trapezoidal section) principally undergo permanent deformations so that the restored energy is a small fraction of the initial impact energy; in addition, for the same deformation and impact force, the absorbed energy is much greater than with guard rails of known type.

The distance between the internal edge of the guard rail and the internal edge of the pedestals (relative to the road) is such as to prevent the direct collision of a part

of the vehicle against the pedestals. Said collision would clearly be exceedingly dangerous for a vehicle and for its occupants.

Thanks to the considerable rigidity of the principal girder as compared with that of the pedestals, in the presence of a high impact force a great number of pedestals are brought into play and consequently the restraining reactions of a single pedestal are kept in check. In addition it follows that the angle of inclination of the deformed girder is limited and therefore the vehicle that collides with it is not subject to excessive longitudinal and transverse decelerations, as would occur if the girder were to form too pronounced a pocket on impact.

It is clear from what has been said above that the guard rail according to the present invention constitutes a considerable step forward in this branch of technology.

Modifications and variants can be provided to the guard rail of the present invention, without thereby going outside the protective field of the invention. In particular, the form of the intermediate support elements **5** may be varied.

What is claimed is:

1. A guard rail comprising a very rigid first stage adjacent the edge of a highway and formed of a plurality of lowly rigid vertical pedestals joined to a very rigid horizontal girder, and a second stage formed of a plurality of plastically deformable support elements joined to said girder intermediate said pedestals, and a metal strip fastened to said elements and facing said highway, said stages working in series in that a portion of the impact forces on the second stage are transmitted to the first stage.

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