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3,210,051

HIGHWAY SAFETY GUARD

Filed July 12, 1961

2 Sheets-Sheet 1

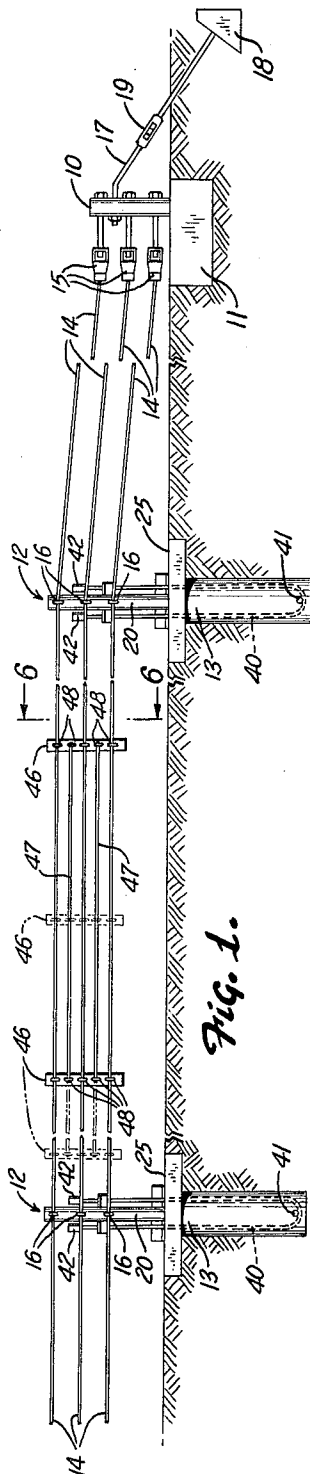


Fig. 1.

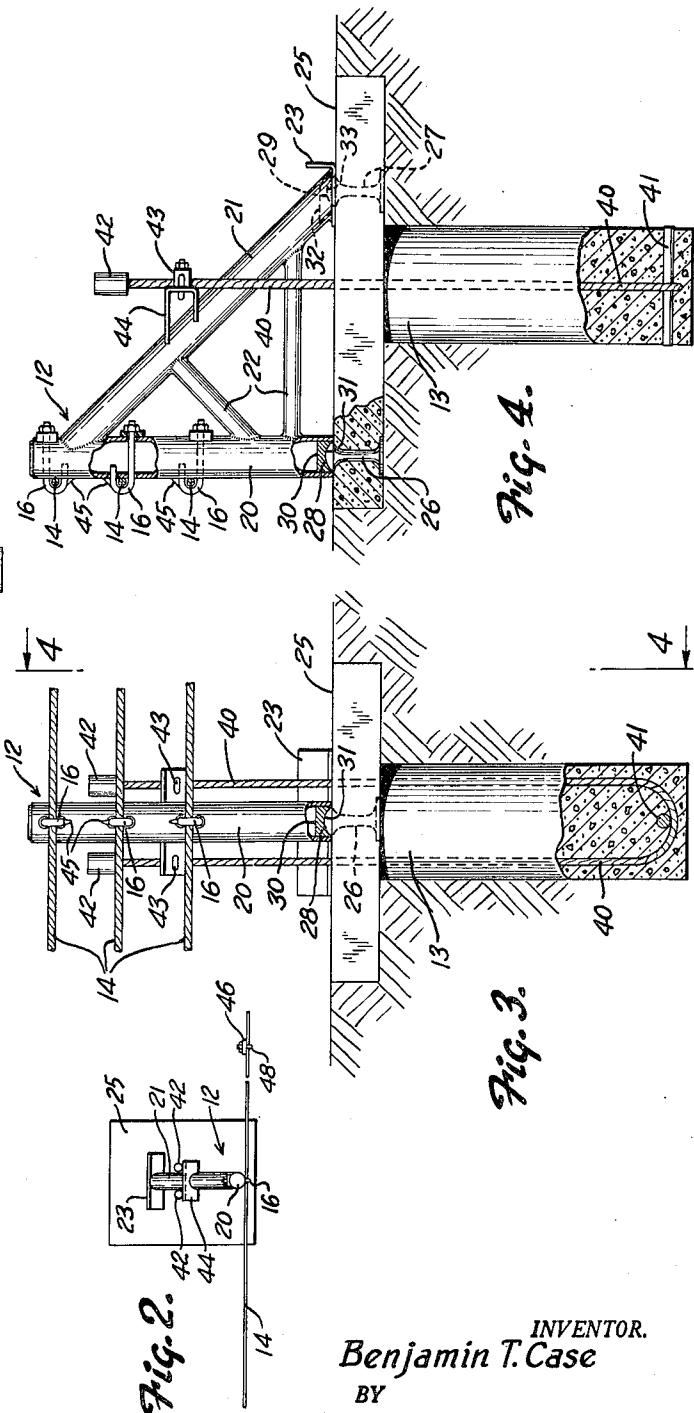


Fig. 4.

Fig. 3.

Fig. 2.

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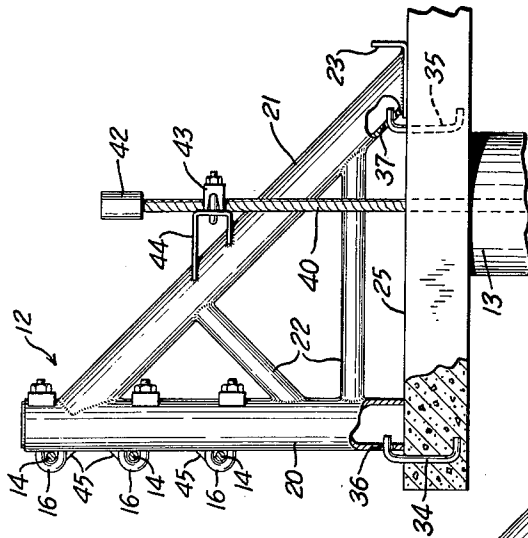


Fig. 7.

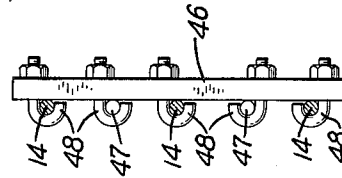


Fig. 6.

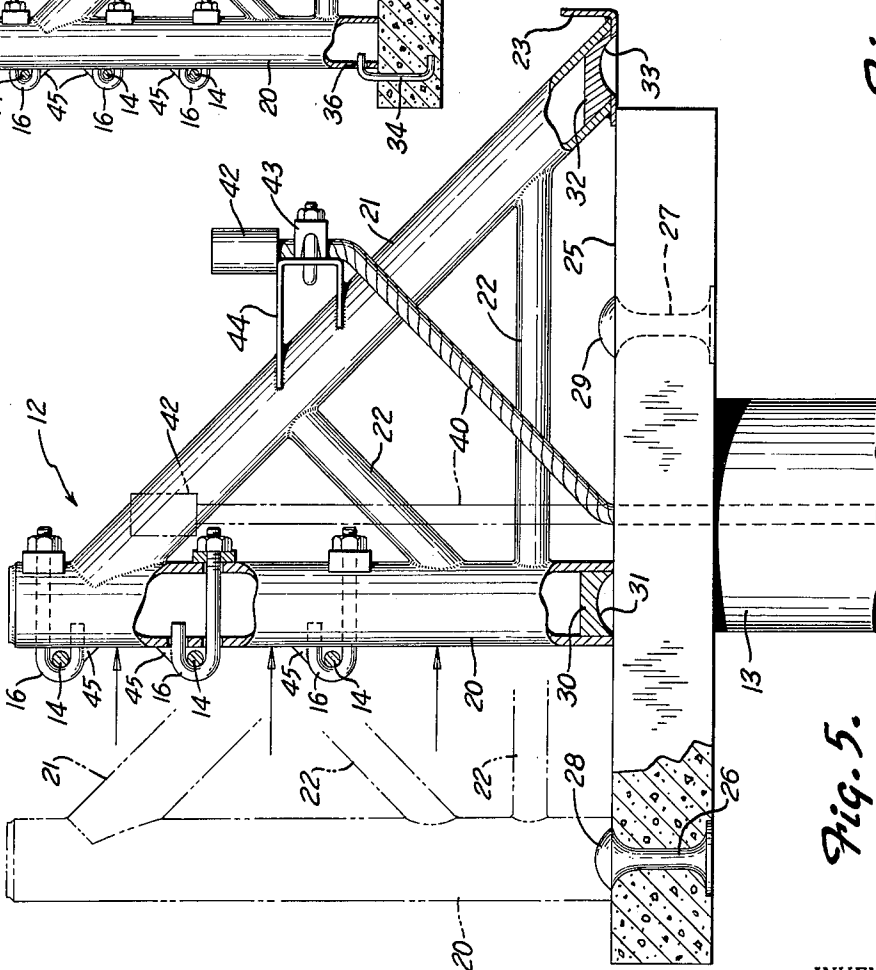


Fig. 5.

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## HIGHWAY SAFETY GUARD

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4 Claims. (Cl. 256—13.1)

The present invention relates generally to improvements in highway guards, and relates more particularly to an improved safety guard rail for highways which will effectively withstand high speed impacts while cushioning or absorbing the shock thereof.

It is an object of this invention to provide an improved and highly efficient highway safety guard rail assemblage which embodies novel cable supports and anchorage means therefor adapted to permit limited displacement under heavy impact from any frontal angle.

Various types of highway guard rails having normally upright supports which are flexible and movable to a limited degree when struck by a vehicle have heretofore been proposed, but the success of these prior devices in each instance has been very limited. For example, United States Patent No. 1,718,875, dated June 25, 1929, shows the use of pivotally mounted posts for carrying the guard cables, the posts being provided with spring shock absorbers; and a somewhat similar structure is disclosed in United States Patent No. 1,857,435, dated May 10, 1932, wherein the cable supporting posts are free to tilt on their stands and are tied to anchors through a spring cushioning or shock absorbing element. The principle objection to the structures shown in these patents is that the supports, when struck and tilted, form an inclined ramp which can be readily climbed by a vehicle traveling at high speed, and the effectiveness of the guard in preventing the vehicle from leaving the highway is thus destroyed.

Another type of highway guard rail heretofore proposed is shown in United States Patent No. 2,265,698, dated December 9, 1941, wherein the guard cables are carried in spaced relation by tripod uprights which are freely slidably supported on concrete slabs, the lateral displacement or movement of each tripod support being limited by means of a single anchored cable tied to a deadman. While the tripod support used in this assemblage obviated the objections attendant the tilting supports of the previous guard rails, the free shifting of the tripods on the concrete platforms and the single cable anchorage was objectionable, and these guards did not afford the necessary strength and durability against high speed impact. Furthermore, the single anchor cable connection to each of the supporting tripods proved ineffective and the entire assemblage was undesirably costly and not sufficiently competitive with standard fixed guard rail structures to enjoy any great degree of commercial success.

It is therefore an important object of this invention to provide an improved safety highway guard which obviates all of the above-mentioned disadvantages of prior devices intended for like purposes.

Another object of the present invention is to provide an improved highway guard for preventing moving vehicles from accidentally leaving the road or crossing the center strip into the opposing lane of traffic, and which is extremely strong and durable in construction with bipod supports being used for supporting and spacing guard cables or stringers, the bipod supports being maintained in an upright position at all times.

Still another object of this invention is to provide an improved highway guard rail in which the regularly spaced cable supporting structures are anchored to the highway shoulder in a unique manner in their initial

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position by bipod supports displaceable from their initial anchoring means upon receiving heavy impacts such as would normally do considerable damage and being movable from their initial positions to a limited extent in order to absorb shock and prevent serious injury to the vehicle or its occupants, the shock or energy absorbing action being such as to exclude the possibility of deflection or penetration by a vehicle.

A further object of the invention is to provide an improved highway safety guard rail embodying yieldable stringer supporting structures which are limited in their movement by means of a single flexible anchoring cable having both of the opposite ends thereof cooperating through a friction clamp to stabilize and guide the supporting structures in their lateral movement upon displacement by heavy impacts, the cable ends also cooperating to definitely limit the lateral movement of the structures in a manner permitting ease of scientific adjustment or regulation by merely varying the distance between the limit stops and the friction clamp.

A further object of the present invention is to provide an improved highway guard rail which embodies bipod supports which are laterally movable under high speed impacts from any frontal angle and in which the cables are definitely retained in predetermined spaced relationship by a novel cable spacing device which is readily shiftable for repositioning following an impact causing displacement thereof.

Still another object of the present invention is to provide an improved safety highway guard rail assemblage which may be readily produced and installed at relatively low cost and which, while being flexible and resilient to a sufficient degree to permit effective cushioning and absorbing of shocks and therefore a minimum of damage to vehicles and their occupants, is nevertheless extremely durable, stable, and highly efficient in actual use.

A clear understanding of the construction and of the mode of operation of my improved device may be had by referring to the drawings accompanying and forming a part of the present specification wherein like reference characters designate the same or similar parts in the several views:

FIG. 1 is a fragmentary front elevation of a highway guard rail construction embodying the safety features constituting the present invention, with the anchorage devices and supporting platforms being shown in section and the cable spacer being shown in normal position by means of full lines and in a shifted position by means of broken lines;

FIG. 2 is a top fragmentary view of one of the supports as it rests in normal position on its supporting platform;

FIG. 3 is a somewhat enlarged fragmentary front elevation of one of the bipod cable supports and its anchoring means, the deadman to which it is anchored being shown partially in vertical section;

FIG. 4 is a similarly enlarged side elevation of the bipod support and its anchoring mechanism and supporting platform looking at the same in the direction of the arrows 4—4 of FIG. 3 and showing the front leg of the bipod and a portion of the deadman anchor in section to illustrate one means of initially positioning the bipod;

FIG. 5 is a further enlarged view similar to FIG. 4 but showing the bipod support driven from its initial stabilizing anchor or mounting and moved laterally to the extent permitted by the limit cable and anchor;

FIG. 6 is a section through the cable adjacent one end of the cable spacer as taken along the line 6—6 of FIG. 1; and

FIG. 7 is another side elevation of the bipod support showing the front leg and a portion of the platform in

section to illustrate an alternate means for initially positioning the bipod support.

Referring to the drawings, the typical highway guard rail shown therein as embodying the improved supporting and anchoring structure comprises, in general, a pair of fixed upright end posts 10 each freely supported on a concrete platform 11, a plurality of upright bipod supports 12 spaced between the end posts 10 and each anchored for limited lateral movement under heavy impact to a deadman and platform 13, and a plurality of stringer cables 14 clamped at their opposite ends to the end posts 10 as by means of suitable turnbuckles or tensioning clamps 15 and having the intermediate portions thereof strung through vertically spaced clamps or J bolts 16 carried by the front vertical legs of the bipod supports 12.

As indicated, the end posts 10 are freely supported on the concrete slabs or bases 11, and these posts are stabilized as by means of anchor rods 17 each having one end secured to a medial portion of its respective post 10 and the other end to a suitable deadman or anchor 18, the tension thereon being adjustable by means of turnbuckles 19 or the like. The intermediate bipod supports 12 each have a substantially vertical front leg 20 and a single inclined rear leg 21 formed of conventional channel bar stock or tubing united as by welding at their apex, the legs 20, 21 being further braced as by one or more bracing members 22 welded therebetween, to maintain the bipod supports 12 rigid at all times, the inclined rear leg 21 of each support is provided with a shoe 23 in the form of an angle iron or the like welded thereto so as to extend laterally in opposite directions therefrom.

Each of the bipod supports 12 is positively positioned on the upper platform section 25 of its respective deadman 13, but it is important that the positioning and stabilizing means for the supports are such as will permit release under heavy impacts. To this end, a pair of male fittings 26, 27 are preferably cast in each of the platforms 25, each of the respective fittings 26, 27 having upper segmental spherical crown portions 28, 29, extending above the upper surface of its platform 25 with the fittings 26, 27 being spaced apart a distance equal to the distance between the lower ends of the legs 20, 21. In turn, the front leg 20 of each bipod support 12 is provided with a female fitting 30 at its lower end having a segmental spherical recess or socket 31 adapted to receive the spherical crown 28 of the front fitting 26, and the rear leg 21 is similarly provided with a female fitting 32 at its lower extremity also having a spherical recess 33 for receiving the spherical crown 29 of the rear fitting 27. The spherical positioning members 28, 29 thus provide means for positively locating the supports 12 on their respective platforms.

As an alternate design for the ball type stabilizer and to hold each support 12 in position and resist lateral movement thereof except under relatively heavy impacts such as require a cushioning or shock absorbing effect to minimize damage and injury, the legs 20, 21 are restrained from displacement by metal stabilizing hooks 34, 35 of generally C-shape which are also preferably cast in each platform, the upper rearwardly extending portion of the hook 34 entering an aperture 36 formed in the lower front portion of the leg 20 and the upper rearwardly extending portion of the hook 35 similarly entering an aperture 37 formed in the lower front portion of the leg 21 to thereby restrain upward movement and to initially maintain the positive positioning of the cable supporting structure 12.

To anchor the upright supports 12 while limiting the lateral movement thereof under such impacts as might displace the same from the positioning and stabilizing means, a snubber or anchor cable 40 is embedded in each deadman 13 as shown, the cable 40 having the medial portion preferably cast in the concrete deadman 13 along with a suitable anchor pin 41 and having the opposite laterally spaced free ends thereof extending an equal distance above the platform 25. The upwardly extending

ends of the anchor cable 40 are provided with suitable stops or limit stops 42 firmly secured to the extremities thereof, and some distance below the limit stops 42 the extending cable portions are clamped by suitable spaced friction clamps 43 in turn secured to the medial portion of the inclined rear leg 21 of the bipod support 12 as by means of a snubber block or bracket 44 welded thereto. Thus, the support 12 is initially positioned and normally restrained from lateral displacement by the stabilizing spherical stops 28, 29 or by the stabilizing hooks 34, 35 as the case may be, but when displaced by a heavy impact, the support 12 moves laterally against the resistance of the friction clamps 43 coating with the free ends of the snubber or anchor cable 40 until the limit stops 42 become effective to positively restrain further displacement or movement of the support, the bipod supports 12 being retained in upright position by the combined action of the rear foot 23 and the laterally spaced clamped ends of the anchor cable 40.

To permit flexibility of movement between the supports 12 and the guard cables 14 carried thereby without placing unnecessary strain and tension on the cables, the U bolts or J bolts 16 are preferably formed with integral shoulders or stops 45 or the like which prevent tightening to such an extent to clamp or pinch the cables 14. In other words, means are provided to permit free movement of the supporting structures 12 relative to the cables 14, thus enabling utilization of the resiliency of the cables 14 as shock absorbing members for the full length thereof between the end posts 10. Furthermore, means have been provided herein for retaining the cables 14 equally relatively spaced at intervals between the supports 12, such cable spacer being shown in FIG. 1 and comprising either a single or a pair of spaced elongated plates, bars, or rods 46 interconnected by one or more lengths of cable 47 to maintain the proper spacing therebetween and each of the spacer plates 46 carrying spaced C-shaped bolts 48 frictionally clamping the cables 14 in properly spaced relative position. The cable spacers are normally secured to the cables 14 in the approximate position shown by full lines in FIG. 1, and if they should be moved by the force of an angular impact, as shown for example by means of broken lines in FIG. 1, they can be returned to their normal full line positions readily by merely loosening the clamps 48, shifting the spacers 46, and then retightening the clamps or U bolts.

Safety guard rails embodying the features of the present invention have proven highly successful in actual tests, and the cushioning or shock absorbing action obtained thereby has permitted vehicles to be driven against the safety guard rail at speeds up to sixty miles per hour with relatively minor damage to the vehicle and without any injury whatsoever to the driver. Furthermore, the spacing the guard cables is effectively maintained and the cables and their supports are retained in vertical position at all times to thus minimize the danger of having the vehicle vault the fence. While the elements 14 have been referred to herein as being in the form of cables, these stringers may be in the nature of bars, plates, or beams without destroying the effectiveness of the invention; and since the end posts 10 are freely supported on the platforms 11, proper adjustments may be readily effected in the tension of the stringers 14 as well as the anchor rods 17 or by means of the turnbuckles 15, 19 respectively.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In a highway safety guard: a plurality of spaced supporting bases, each of said bases being immovably mounted adjacent said highway; a frame supported on each of said bases, each of said frames consisting of a vertical post, a rearwardly and downwardly sloping post

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connected at its upper end to the upper end of the vertical post and extending to a point spaced from the bottom of the vertical post, and bracing members joining said posts to form a rigid frame, the two posts lying in a plane perpendicular to the direction of the highway; snubber cables secured in each of said bases, and having two ends thereof projecting from each of said bases in spaced relation to each other, in planes on opposite sides of and parallel to the plane of the posts and spaced from the posts; a snubber block formed on each sloping post to engage the two cables secured in the supporting base with one cable on either side of the sloping post; means on the snubber blocks to engage the cables to retard the movement of the frame under load; and stop elements formed adjacent the outer ends of the cables to limit the movement of the frames.

2. In a highway safety guard as defined in claim 1, including a plurality of stringer cables extending substantially parallel to the surface of the highway, means secured to the vertical posts of the frames to secure the stringer cables in spaced parallel position on the vertical post, a deadman secured adjacent each end of the guard

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rail, means to secure the stringer cables to the deadmen, and means to place the stringer cables under tension.

3. A highway safety guard as recited in claim 1 in which means are formed in the base members to releasably retain the frames in alinement on the base and to release said frames for limited movement when acted upon by an external force.

4. A highway safety guard as defined in claim 3 in which the retaining means includes a spherically shaped protuberance formed in the base and correspondingly shaped socket formed in the vertical posts.

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