July 28, 1953 N. E. HENDRICKSON 2,646,969

HIGHWAY GUARD

Filed Jan. 7, 1950

Fig. 1.

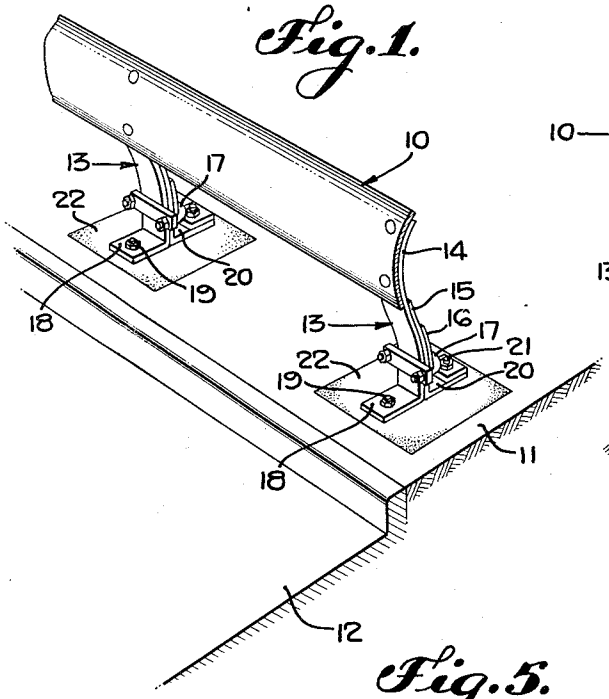


Fig. 2.

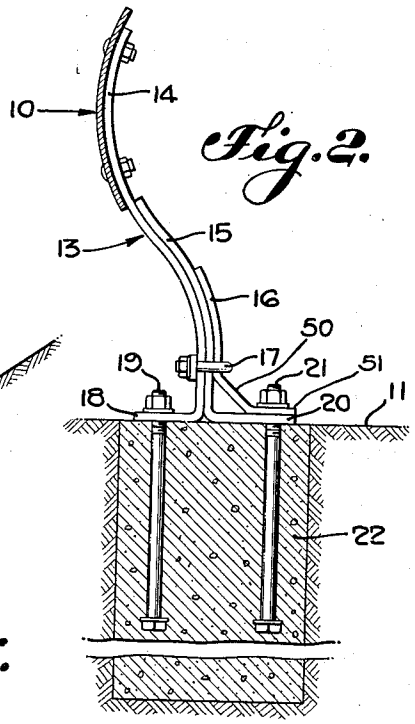
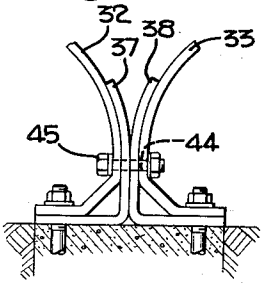


Fig. 5.



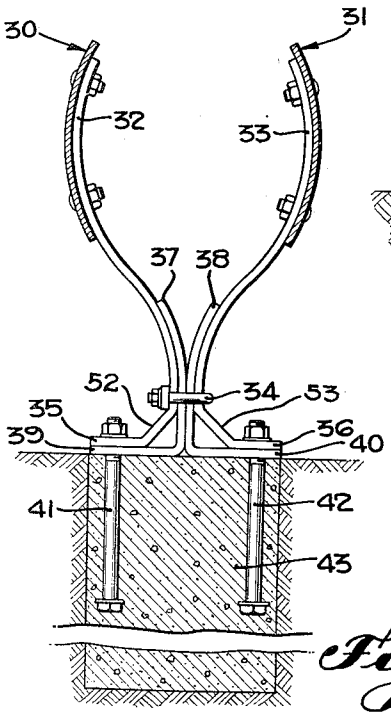


Fig. 4.

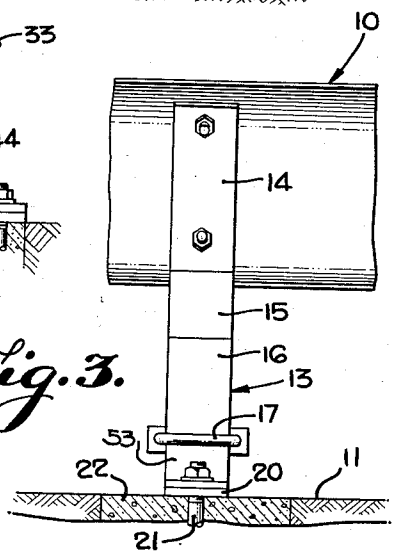


Fig. 3.

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UNITED STATES PATENT OFFICE

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HIGHWAY GUARD

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12 Claims. (Cl. 256—13.1)

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This invention relates to a road guard for highways and has particular reference to a resilient road guard which may be used to divide a highway into directional lanes or to define the sides of dangerous stretches of highway.

Modern high speed roads for motor cars require improved protective devices to prevent vehicles traveling at great speed from entering into a traffic stream moving the opposite direction. Conventional highway guards for accomplishing this result fall into two types. An example of the first type is a reinforced concrete wall which is effective to separate oppositely moving traffic streams on the same highway, but such walls are costly to construct and the violent, unyielding impact between a fast moving vehicle and such a wall may totally demolish the vehicle, or damage it so that it becomes a traffic hazard in its own lane. An example of the second type is a metal bumper strip having some resilience and supported upon a row of posts extending along the highway, but such posts break off at the ground level under shock or impact loads since they have no appreciable elasticity. If a highway guard assembly of the latter type is made heavy enough to withstand such impacts, its deflection under load is so small that it has the same effect as a concrete wall upon the moving vehicle.

My invention contemplates the use of initially curved spring supports for a bumper strip, which supports bow outwardly toward the roadway and permit relatively great inward deflection of the bumper strip under impact loads, so that the shock is cushioned and the moving vehicle deflected back into the roadway with a minimum of damage.

Another object of my invention is to provide a highway road guard having novel spring-steel support means.

A further object of my invention is to provide a highway road guard having extremely high impact absorption or energy storage capacity.

Another object of my invention is to provide a highway road guard having anchoring means of great strength and rigidity.

Other objects and advantages of my invention, it is believed, will be apparent from the following detailed description of preferred embodiments thereof as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a perspective view of a preferred embodiment of my invention illustrating the same as adapted to be used along the side of a highway.

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Figure 2 is a side elevation, partially in vertical section.

Figure 3 is a front elevation, partially in vertical section.

Figure 4 is a side elevation of a preferred embodiment of my invention, adapted for use in dividing a highway into directional lanes.

Figure 5 is a fragmentary side elevation illustrating a modified form of my invention.

Briefly, my invention includes an improved mount for a road guard making use of curved members of heavy steel in the form of leaf springs. The individual leaf springs in each support are secured together and are spread laterally to provide a rigid anchor in cement blocks. The support members are designed for maximum energy storage so that the impact shock may be absorbed and the vehicle deflected back into the roadway.

It can be shown, for steel functioning in bending, that

$$W=\frac{S^2V}{6E}$$

where

W=energy storage in inch-pounds
S=stress, in pounds per square inch
V=volume of active steel in cubic inches
E=modulus of elasticity in bending.

From this relationship it is apparent that energy storage capacity varies directly with the active volume of steel and directly as the square of the stress. Since high energy storage is desired, the steel must be capable of withstanding high stresses without permanent deformation, and accordingly I prefer to use heat treated spring steel for the bumper strip supports. These supports store and release a maximum amount of energy and their utility lies chiefly in the way that they increase the time in which the road shocks are absorbed and released.

Referring now to the drawings, particularly Figures 1–3, it will be seen that a preferred embodiment of my invention includes a bumper strip or guard rail 10, of convex cross-section, maintained in position on the shoulder 11 of roadway 12 by means of a series of support members or legs generally designated 13.

The support members are composed of leaf spring elements or leaves 14, 15 and 16, progressively decreasing in length and connected together by means of U-shaped bolts 17. The upper portions of leaves 14 are curved on a ra-

dius equal to the radius of curvature of the guard rail 10, so that the rail may be securely fastened to the leaves. The middle portions of the leaves 14 are curved in the opposite direction, terminating at the lower ends thereof in straight, vertical sections bent to form horizontal arms 18 through which anchor bolts 19 are inserted. The leaves 15 are considerably shorter than the leaves 14 and are similarly curved, terminating at the lower ends thereof in horizontal arms 20 through which anchor bolts 21 are inserted. Additional leaves 16 are provided, formed as shown so that the portions thereof below the U-bolt 17 furnish brace means for the support members. The lower portions of the leaves 16 are provided with an inclined strut 50, and a horizontal foot 51 which overlaps one of the horizontal arms 20 and rests thereon. The lower portions of the leaves 14 and 15 are positioned in back-to-back abutting relationship adjacent the location of their right angle bends. The anchor bolts 19 and 21 may be embedded in concrete base blocks 22 to provide a firm footing for the guard rails.

Figure 4 illustrates my invention as it may be adapted to be used in dividing a highway into directional lanes. The curved guard rails 30 and 31 are secured to curved leaf members 32 and 33, which are identical in shape and of opposed disposition. The lower portions of leaves 32 and 33 curve downwardly to the connecting U-bolts 34 and then laterally at an angle as shown, terminating in horizontal feet or base portions 35 and 36. The inclined bracing struts 52 and 53 connect the foot 35 to the leaf 32 and connect the foot 36 to the leaf 33, respectively. Short leaves 37 and 38 cooperate with the leaves 32 and 33 to furnish additional strength and their abutting portions are bent at right angles to form horizontal arms 39 and 40. Anchor bolts 41 and 42 are inserted through the horizontal arms and embedded in concrete blocks 43.

It will be seen from the above description that I have provided a road guard of great strength and energy storage capacity. The curved disposition of the leaf members allows for maximum deflection while the short leaves combine with the long leaves to form leaf spring assemblies of substantially uniform stress.

A modified form of connection means for the supporting leaf spring element is illustrated in Figure 5. Apertures 44 are provided through the vertical portions of leaf members 30, 31, 37 and 38 through which a bolt 45 is inserted. This construction is less strong than the U-bolt means described above, since here the leaf members are weakened by the apertures cut therethrough. However, this arrangement may be desirable under certain conditions since if sufficient force is exerted on the rail to shear the support members or leaves, they will tend to shear at the weakest point, which is adjacent the apertures 44, without damage to the anchor bolts 42, thereby simplifying replacement.

While I have shown and described specific embodiments of my invention, I do not limit myself to the exact details of the constructions set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

I claim:

1. A support member for a road guard, said support member including a leaf spring member inclined at an angle from the vertical, said leaf spring member including a plurality of leaves, the lower portions of said leaves being formed into overlapping horizontal base members, one of the overlapping base members being formed with an inclined bracing strut, and means associated with said base members for anchoring said base members adjacent a roadway.

2. A support member for a road guard, said support member including a leaf spring member inclined at an angle from the vertical, said leaf spring member including a plurality of leaves of progressively decreasing size, the lower portions of said leaves being formed into horizontal base members, two of the base members extending in one direction and another extending in an opposite direction, one of the two said base members overlapping the other and being formed with an inclined bracing strut, and means associated with said base members for anchoring said base members adjacent a roadway.

3. In a support member for a road guard, the combination of a relatively long leaf spring member having a curved upper portion and a vertical central portion terminating in a horizontal lower portion, a relatively short leaf spring member contacting the surface and conforming to the shape of the long leaf member along the major portion of the short leaf spring member, said short leaf member having a horizontal lower portion extending in a direction opposed to the horizontal lower portion of said long leaf member, means connecting the long and short leaves together adjacent the lower portions thereof, and anchor means cooperating with said horizontal lower portions whereby the support member is anchored adjacent a roadway, said means including a pair of substantially vertical anchor bolts, one extending through each of said horizontal lower portions.

4. In a support member for a road guard, the combination of a pair of relatively long leaf spring members having curved upper portions, said upper portions diverging away from each other, the lower portions of said spring members being formed into oppositely directed horizontal base members each provided with an inclined strut, a short leaf spring member contacting the surface and conforming to the shape of each of said pair of long leaf members along the length of said short leaf member, means connecting said long and short leaf members together at the lower ends thereof, and anchor means cooperating with said horizontal lower portions whereby the support member is anchored adjacent a roadway, said means including a pair of substantially vertical anchor bolts, one extending through each of said horizontal base members.

5. In a road guard, the combination of: a pair of relatively long leaf spring members having curved upper portions, said upper portions diverging away from each other, the lower portions of said spring members being formed into oppositely directed horizontal base members each provided with an inclined strut, a short leaf spring member contacting the surface and conforming to the shape of each of said pair of long leaf members along the length of said short leaf member, means connecting said long and short leaf members together at the lower ends thereof, anchor means cooperating with said horizontal lower portions whereby the support member is anchored adjacent a roadway, said means including a pair of substantially vertical anchor bolts, one extending through each of said horizontal base members, and a guard rail of

curved formation secured to the curved upper portions of each of said long leaf spring members.

6. In a support member for a road guard, the combination of a pair of relatively long leaf spring members having curved upper portions, said upper portions diverging away from each other, a short leaf spring member contacting the surface and conforming to the shape of each of said pair of long leaf members along the length of said short leaf member, one pair of long and short leaf spring members having horizontal lower portions extending in one direction and the other pair of long and short leaf spring members having horizontal lower portions extending in the other direction, the lower portions of the two short leaf spring members being in back-to-back abutting relationship, means connecting said long and short leaf members together at the lower ends thereof, and anchor means cooperating with said horizontal lower portions whereby the support member is anchored adjacent a roadway, said means including a pair of substantially vertical anchor bolts, one extending through each of said horizontal base members.

7. In a road guard, the combination of: a support member, said support member including a curved leaf spring member inclined at an angle from the vertical, said leaf spring member including a plurality of curved leaves disposed in surface-to-surface contact, the lower portion of one of said leaves being formed with a right angle bend to provide a horizontal base member, another of the leaves having a portion at its lower end provided with two spaced angle bends defining an inclined strut and a second horizontal base member, the latter said horizontal base member resting upon the first said base member, means associated with said base members for anchoring them adjacent a roadway, and a guard rail supported by said leaf spring member.

8. In a road guard, the combination of: a support member, said support member including a substantially vertical leaf spring member having a curved upper portion and comprising a plurality of leaves of progressively decreasing size disposed in surface-to-surface contact, the lower portion of one of said leaves being formed with a right angle bend to provide a horizontal base member, another of the leaves having a portion at its lower end provided with two spaced angle bends defining an inclined strut and a second horizontal base member, the latter said horizontal base member resting upon the first said base member, means associated with said base members for anchoring them adjacent a roadway, and a guard rail of curved formation secured to said leaf spring member at the curved upper portion thereof.

9. A support member for a road guard, said support member including a substantially vertical leaf spring member having a curved upper portion and comprising a plurality of leaves of progressively decreasing size, the lower portions of said leaves being formed into spaced horizontal base members, two of the base members extending in one direction and another extending in an opposite direction, one of the two said base members overlapping the other and being

formed with an inclined bracing strut, and means associated with said base members for anchoring them adjacent a roadway, said means including a pair of substantially vertical anchor bolts, one extending through each of said horizontal base members.

10. A support member for a roadway guard rail, comprising in combination: a curved leaf spring member having at least two leaves in surface-to-surface contact, one of the leaves being longer than the other, one of the leaves having a right angle bend at its lower end providing a horizontal base member, the other leaf having an inclined bracing strut and a horizontal foot at its lower end, the foot overlying and resting upon the base member, means located above the upper end of the inclined strut for securing the leaves against separation, and an anchor bolt extending through both the foot and the base member whereby the support member is anchored adjacent a roadway.

11. A support member for a roadway guard rail, comprising in combination: a curved leaf spring member having three leaves in surface-to-surface contact, the leaves being of progressively decreasing length, the longest leaf and leaf of intermediate length each having a right angle bend at its lower end providing a horizontal base member, said base members abutting back-to-back and extending in opposite directions, the shortest leaf having at its lower end an inclined strut and a horizontal foot overlying one of the base members, means located above the upper end of the angle strut for securing all three leaves against separation, a first anchor bolt for anchoring the base member on the longest leaf, and a second anchor bolt for anchoring the foot and the other base member.

12. A support device for a highway divider, comprising in combination: a pair of symmetrical leaf spring members having curved upper portions diverging away from each other, each of said members having a pair of leaves in surface-to-surface contact, one of the leaves in each member being longer than the other, the shorter leaves each having a right angle bend at its lower end providing a horizontal base member, said base members abutting back-to-back and extending in opposite directions, the longer leaves each having an inclined strut and a horizontal foot overlying one of the base members, means located above the upper end of the angle struts for securing all four leaves against separation, and a pair of anchor bolts, each anchor bolt extending through one of the horizontal feet and through one of the horizontal base members.

NIELS E. HENDRICKSON.

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