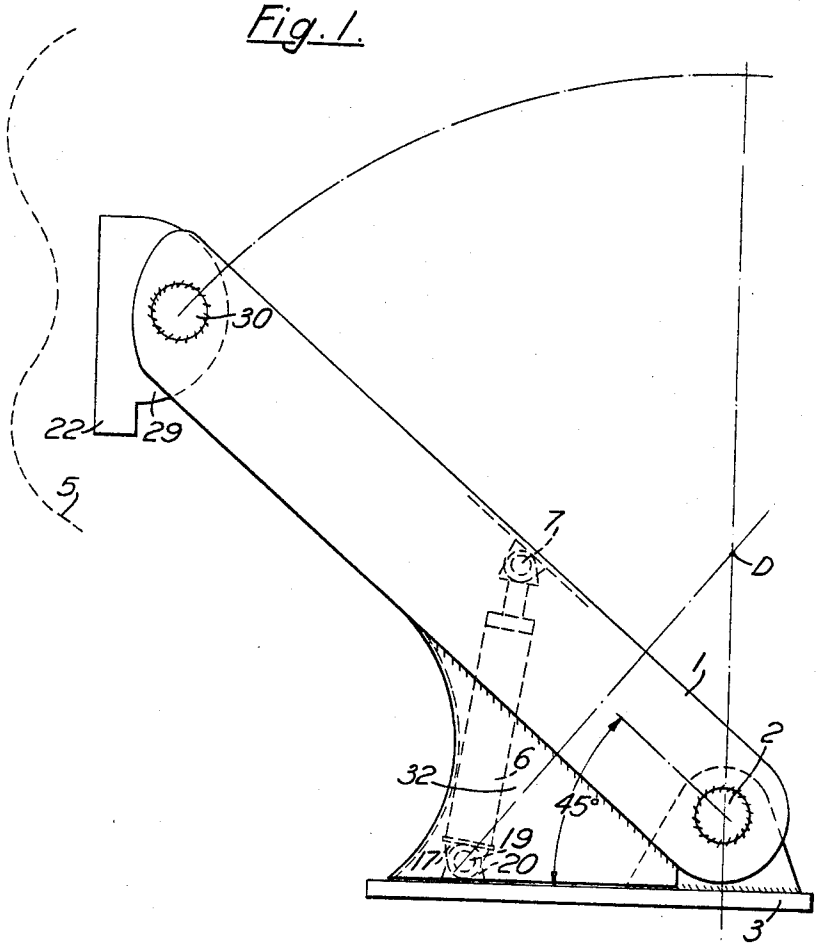
May 28, 1968 G. PERSICKE 3,385,564

HIGHWAY GUARD RAIL SUPPORTS

Filed June 18, 1965 3 Sheets-Sheet 1

Fig. 1.



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HIGHWAY GUARD RAIL SUPPORTS

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Fig. 2.

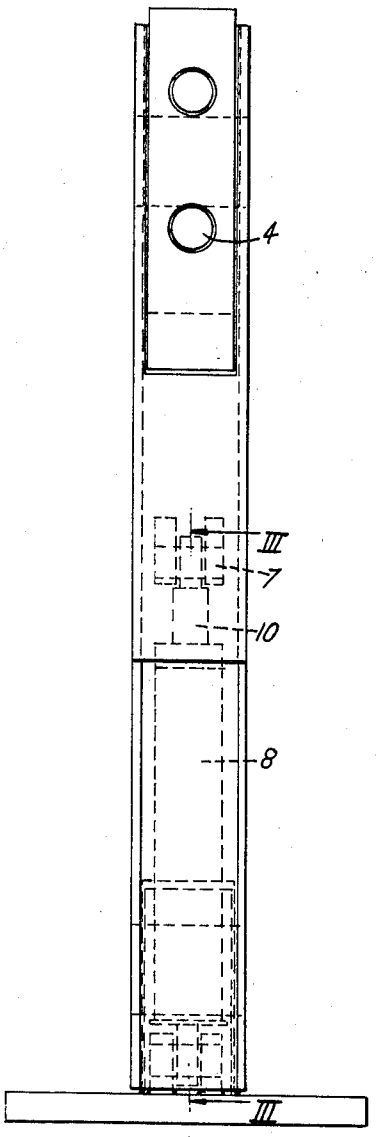
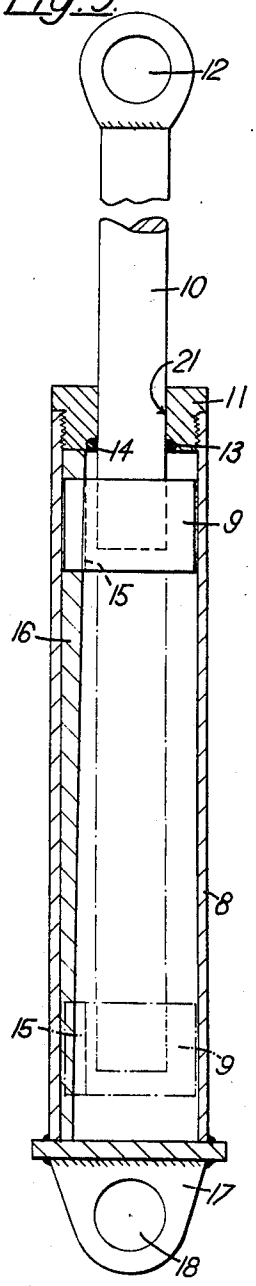


Fig. 3.



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HIGHWAY GUARD RAIL SUPPORTS

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Fig. 4.

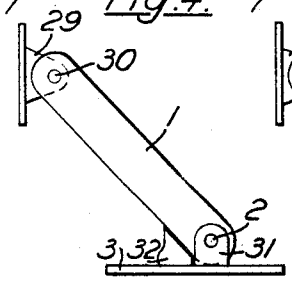


Fig. 5.

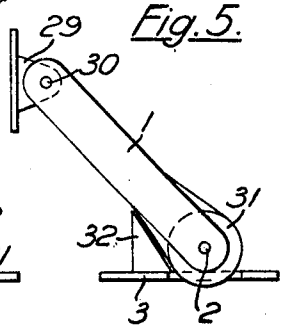


Fig. 6.

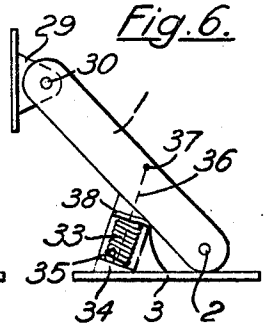


Fig. 7.

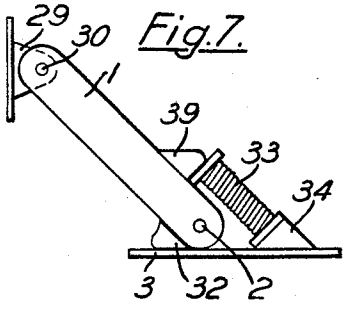


Fig. 8.

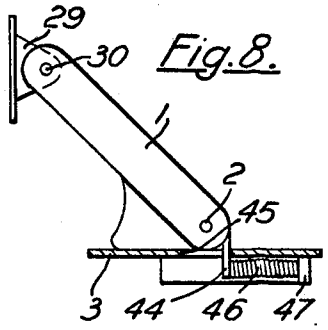


Fig. 9.

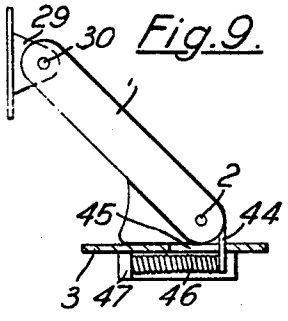


Fig. 10.

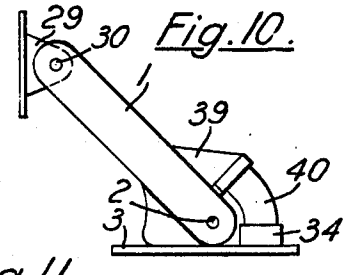
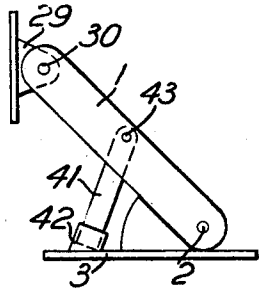


Fig. 11.



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3,385,564

HIGHWAY GUARD RAIL SUPPORTS

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Claims priority, application Great Britain, Nov. 11, 1964, 46,011/64; Apr. 23, 1965, 17,319/65
7 Claims. (Cl. 256—13.1)

This invention relates to a highway guard rail supporting means and in particular to a support for a guard rail such as is disposed along a highway round a bend. The existing posts are rigid, either steel or wood fixed in the ground, and in the event of the guard rail being crashed into by a vehicle they tend to bend or break and do not always serve the purpose of preventing the vehicle leaving the road or cushioning the rapid deceleration of the vehicle. The guard rail has to be a predetermined height; normally it is just under two feet above the surface of the road, that being the height of the standard bumper of the majority of motor vehicles on the road.

The main object of the present invention is to provide a support for such guard rails which will withstand the impact of a vehicle crashing into it and will yield to the extent of absorbing the momentum of the vehicle and bringing it to a halt near to the road side, thereby minimising the danger to other road users, to drivers and passengers of the crashed vehicle, while reducing or minimising the cost of repairing the rail after damage.

According to the present invention a highway guard rail support comprises a base member for fixing to the ground, an arm pivotally mounted at one end to the base to swing upwardly, a pivotal guard rail mount on an upper portion of the arm, and a shock absorber associated with said arm to damp movement of the arm with respect to the base on an impact occurring on the guard rail, the arm being located in an inclined position when at rest so that the guard rail is supported at a predetermined height above the ground. The guard rail mount may comprise a bracket pivoted to the upper end of the arm.

The shock absorber is preferably a resilient device which may be arranged in a variety of ways. In one preferred construction the shock absorber comprises a hydraulic buffer one end being mounted on a member fixed with respect to the base and the other end being pivotally connected to the arm.

The shock absorber preferably comprises a cylinder pivoted at one end to the base, and having a piston sliding therein with its upper end extending through an oil-tight seal out of the cylinder, the free end of the rod having an eye or the like for pivotal connection to the arm.

The piston preferably has a slot therein parallel to the longitudinal axis of the cylinder and a tapered strip is disposed in the cylinder in engagement with the slot, so that as the piston moves in the cylinder the oil path through the slot is diminished by the strip thereby increasing the damping effect of the absorber.

In another embodiment the shock absorber is a coil spring arranged around the pivot joining the arm and base, the ends of the spring respectively engaging the arm and the base so that the torsional force applied to the spring by swinging movement of the arm about the pivot tightens the coil which thereby resists movement of the arm.

In another construction, a coil tension spring is arranged in compression between members fixed with respect to the base and arm, a connection being provided between a portion of the spring and the arm so that the spring is tensioned on upward movement of the arm. Alternatively, the spring is a compression spring which

may initially be in tension and is so arranged in relation to the arm and base that swinging movement of the arm compresses the spring. For this purpose the spring may be constrained between abutments respectively formed on or fixed with respect to the arm and base, the spring-contacting surfaces of the abutments preferably being at right angles to the arm when the latter is in the rest position.

The coil spring may be arranged below the base and constrained either in tension or compression between an abutment fixed with respect to the base and a portion fixed with respect to or on an arm extending below the base so that movement of the arm either compresses the spring, if a compression spring, or stretches the spring, if a tension spring.

The shock absorber may be a rubber block instead of the coil spring, the block being arranged to absorb impact shocks on the guard rail either by being tensioned or compressed.

The arm may be supported in the rest position either by the shock absorbing device, if convenient, or alternatively by a supporting member disposed between the arm and the base and attached to either the arm or base.

The bracket supporting the guard rail is preferably provided with a device which with the weight of the guard rail mounted thereon is balanced at all times thereby maintaining the guard rail vertical at rest and during upward movement of the arm.

In order that the invention may be more fully understood various embodiments in accordance therewith will now be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a side elevation of a guard rail support;

FIGURE 2 is a front elevation of the support;

FIGURE 3 is a transverse section along the line III—III in FIGURE 2;

FIGURES 4 and 5 are side elevations of guard rail supports using coil springs to which a torsional force is applied by upward movement of the arm;

FIGURES 6 to 9 are side elevations of constructions employing coil springs in tension or compression; and

FIGURES 10 and 11 are side elevations of constructions employing rubber blocks in tension or compression.

In the drawings the same references have been used to designate the same or similar parts.

Referring to FIGURE 1 the guard rail support comprises an arm 1 pivoted at 2 to a base 3 which is secured to the ground as by fixing in a cement block or by fixing with foundation bolts or like means to a cement or other firm foundation at the road-side. At the upper end of the arm 1 there is a bracket 29 pivoted at 30 to the arm, the bracket having means such as bolt holes 4 (FIGURE 2) by which the guard rail, indicated at 5 in dotted lines in FIGURE 1 may be secured to the support.

A shock absorber 6 is provided between the base 3 and the arm 1 and is pivotally mounted on the arm at 7. The absorber comprises (FIGURES 2 and 3) a cylinder 8 in which slides a piston 9 having a piston rod 10 extending through a sealing device 11 out of the cylinder with its free end terminating in an eye 12 by which it is connected by a pivot pin at 7 to the arm. The sealing element 11 is provided with a groove 13 in which is disposed a sealing ring 14 such as a U-shaped ring of leather, rubber, synthetic plastic or like material.

The piston 9 is provided with a slot 15 extending longitudinally thereof and fixed to the interior wall of the cylinder is a tapered strip 16, this strip engaging in the slot 15. Thus when the piston is at the lower position of rest as seen in dotted lines in FIGURE 3 the strip 16 does not fill the slot 15 and therefore when the piston moves upwardly in the cylinder the oil in the cylinder can flow

through the slot from one side of the piston to the other, but as the piston continues to rise in the cylinder the taper of the strip gradually reduces the cross-sectional area of the slot thereby reducing the flow of oil from one side of the piston to the other and acting to slow up the travel of the piston within the cylinder and ultimately to bring the piston to a halt before it strikes the sealing element **11**.

The cylinder has a lug **17** at its lower end in which there is a bearing hole **18** for mounting on a pin **19** through eyes in a bracket **20** fixed to the base. The construction of the cylinder is elementary and does not need any particularly machined parts, it only being necessary to ensure that the bearing surface **21** in the sealing element **11** makes a fluid tight seal round the piston rod **10** to prevent the oil escaping from the cylinder.

The bracket **29** at the upper end of the rod **1** has at its lower portion a counter weight **22** which is so selected that with the weight of the guard rail secured therein and the securing means such as bolts, will keep the assembly in balance dynamically about the pivot **2** so that the guard rail remains with its general plain in the vertical direction. This counterbalance effect is such that when the arm **1** is pivoted about the pivot **2** and its upper end rises the guard rail will always be maintained in the vertical position by the bracket pivoting about the pivot **2**.

The length of the piston rod and of the cylinder **8** is such that when the piston is at the outer end of its run the arm will be in the substantially vertical position and the axis of the pivot **7** will be at the point D in FIGURE 1. It has been found that when the arm has in fact reached the vertical position with the pivot at the point D there is some residual air trapped between the piston and the sealing element **1** which is compressed and as soon as the load such as the crashed vehicle on the guard rail is removed the air will exert itself and tend to push the arm downwardly again and the weight of the arm by its vertical component will cause the arm to move downwardly and the oil will begin to flow through the slot **15** so that in due course the arm will slowly return to its original at rest position.

The arm is preferably provided, as shown in FIGURE 1, with a heel member **32** which supports its weight and correctly positions it, e.g. at 45° to the ground as shown, in the rest position.

Referring to FIGURES 4 to 11 the guard rail support comprises an arm **1** pivoted at **2** to a base **3** which is secured to the ground as in FIGURES 1 to 3. At the upper end of the arm **1** there is a bracket **29** pivoted at **30** to the arm, the bracket having means such as bolt holes for example, whereby the guard rail (not shown) may be secured to the support as in FIGURE 1.

In the embodiment of FIGURE 4, a shock absorber in the form of a coil spring **31** is provided surrounding the pivot **2**, one end of the spring being secured to the arm **1** and the other to the base **3** so that when the arm is moved upwardly in the direction of the arrow A, as for example by an impact occurring on the guard rail, a torsional force is applied to the spring **31** tending to tighten the coil of the spring and thus partially or wholly absorbing the force of the impact on the rail. The arm is supported in the rest position by a generally wedge shaped member **32** attached to the base **3**.

The construction shown in FIGURE 5 is similar to that of FIGURE 4, a coil spring **31** of larger diameter than the pivot **2** surrounding the pivot and having one end in engagement with the arm **1** and the other end in engagement with the base **3**. As in the construction of FIGURE 1, the spring cushions a torsional force applied to it by upward movement of the arm **1**.

FIGURE 6 shows a construction employing a compressed coil spring **33** held between the arm **1** and a portion **34** on the base, having a surface **35** inclined at substantially the same angle as the arm in its rest position, to which surface the spring **33** is secured, as for example by welding. A rod **36** is secured at one of its ends to a plate **38** attached to the end of the spring adjacent the arm, the other end of the rod being pivoted at **37** to the arm so that upward movement of the arm is cushioned by stretching of the spring **33** under the action of the rod **36**. In an alternative arrangement, the spring may be tensioned, and the rod **36** passes through the coil of the spring to be attached by a plate, or in any other suitable manner, to the end of the spring remote from the arm and the plate **38** is fixed with respect to the base, so that upward movement of the arm compresses the spring which in this arrangement is not secured to the base and need not be secured to the plate **38** but is in compression when the arm is in the rest position.

A further alternative arrangement is shown in FIGURE 7, the spring being a compression spring held between abutments **34** on the base **3** and **39** on the arm, the abutments having spring abutting faces generally perpendicular to the arm when the latter is in its rest position. Upward movement of the arm is cushioned in this case by compression of the spring between the two abutments.

FIGURES 8 and 9 show a further construction in which a member **44** attached to or integral with the lower end of the arm **1** extends through an aperture **45** in the base **3** to abut one end of a spring **46**, the other end of which abuts a downwardly extending portion **47** of the base **3**. In the construction of FIGURE 8 the spring **46** is a closely coiled tension spring and is attached to both the member **44** and portion **47** so that upward movement of the arm **1** is cushioned by stretching of the spring. In the arrangement of FIGURE 9, the coils of the spring are spaced and the spring is arranged so that upward movement of the arm is resisted by compression of the coils, the spring preferably being mounted in initial compression with the arm in the rest position.

FIGURE 10 shows a construction similar to that of FIGURE 7 but in which the top of the abutment **34** is substantially horizontal and the spring **33** is replaced by a curved rubber block **40** which is compressed between the abutments **39** and **34** on upward movement of the arm.

In FIGURE 11 a bar of rubber **41** is clamped or otherwise secured at one end to an anchor shown as in a short tubular member **42** fixed, as by welding for example, to the base **3**, the other end being pivoted at **43** to the arm **1** or connected to a member pivoted to the arm. The bar is thus tensioned by upward movement of the said bar and cushions such movement.

The springs of the constructions of FIGURE 8 and 9 may be rubber bars arranged in a similar manner to the springs as described herein.

In order to maintain the assembly of the bracket **29** and guard rail dynamically balanced about the pivot **2**, a counter weight (not shown) may be attached to the bracket **29**. The effect of the resulting counterbalance is such that when the arm **1** is pivoted about the pivot **2** and its upper end rises, the guard rail will always be maintained in the vertical position by the bracket pivoting about the pivot **30**.

The arm is preferably made of steel or iron which can withstand the forces likely to be imposed upon it by a large vehicle weighing several tons crashing into the guard rail.

It will be understood that variations or modifications may be made in the construction without departing from the spirit of the invention as claimed herein; for example any means capable of absorbing a shock on the guard rail and damping the resultant upward pivotal movement of the arm may be employed, including a combination of two or more spring devices or rubber elements or a hydraulic buffer with two or more such devices.

I claim:

1. A highway guard rail support comprising a base member for fixing to the ground, an arm pivotally mounted at one end to said base to swing in an upward direction with respect to said base, a pivotal guard rail mount on an upper portion of said arm and a shock absorber

associated with said arm to damp said movement of said arm on said guard rail being subjected to an impact, said shock absorber connected at one end to said base and at its other end to said arm intermediate the ends thereof, said arm being in an inclined position at rest supporting said guard rail at a predetermined height above the ground, and being movable between said inclined position and a substantially vertical position in response to impact whereby the guard rail is swung upwardly in an arc during and throughout impact, said shock absorber limiting movement of said arm to said substantially vertical position whereby downward arcuate swinging of the guard rail is substantially eliminated.

2. A highway guard rail support according to claim 1 wherein said guard rail mount comprises a bracket pivoted to the upper end of said arm.

3. A highway guard rail support according to claim 1 wherein said shock absorber comprises a hydraulic buffer having one end mounted on a member fixed with respect to said base and the other end pivotally connected to said arm.

4. A highway guard rail support according to claim 1 wherein said arm is provided with a heel shaped member which supports the weight of said arm, said guard rail mount and said guard rail in the rest position.

5. A highway guard rail support according to claim 1 wherein said pivotal mounting of said mount on said arm includes means operable to maintain said guard rail in a balanced condition with said guard rail substantially vertically disposed at rest and when said arm moves upwardly.

6. A highway guard rail support comprising a base member for fixing to the ground, an arm pivotally mounted on said base to swing upwardly, a mount for said guard rail pivotally connected to a portion of said arm spaced above said base, and a shock absorber connected to said arm and said base to damp an upward swinging movement of said arm when said guard rail is subjected to an impact, said arm being in an inclined position at rest supporting said guard rail at a predetermined height

above said base and being movable between said inclined position and a substantially vertical position in response to impact whereby the guard rail is swung upwardly in an arc during and throughout impact, said shock absorber limiting movement of said arm to said substantially vertical position whereby downward arcuate swinging of the guard rail is substantially eliminated, said shock absorber comprising a cylinder element, a piston sliding in said cylinder, a piston rod element connected to said piston and extending through a sealing device out of said cylinder, one of said elements being connected to said base and the other of said elements being connected to said arm.

7. A highway guard rail support according to claim 6 wherein one of said cylinder elements and said piston has a slot therein and the other of said elements has a projection extending into said slot, at least one of said slots and said projection tapering over the length of said cylinder element to vary the cross section of said slot as said piston slides in said cylinder element to increase the resistance of fluid flow through said slot over the upward movement of said arm when said guard rail is subjected to an impact.

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