April 1, 1941. T. R. MINERT 2,237,106

HIGHWAY BARRIER

Filed April 25, 1938 2 Sheets-Sheet 1

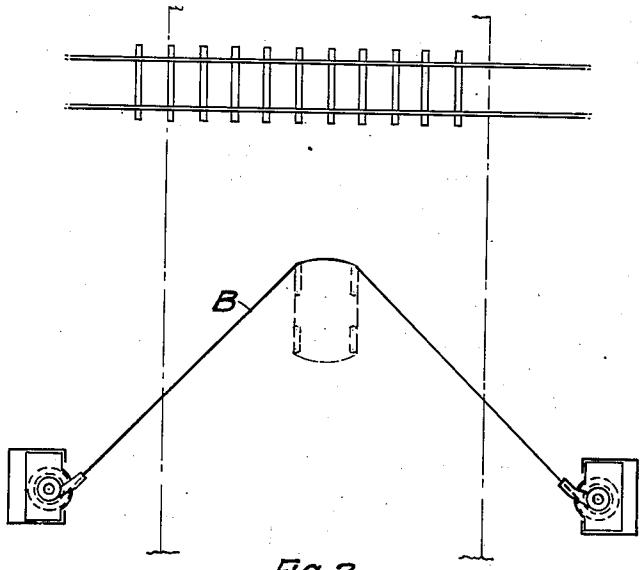


Fig 2

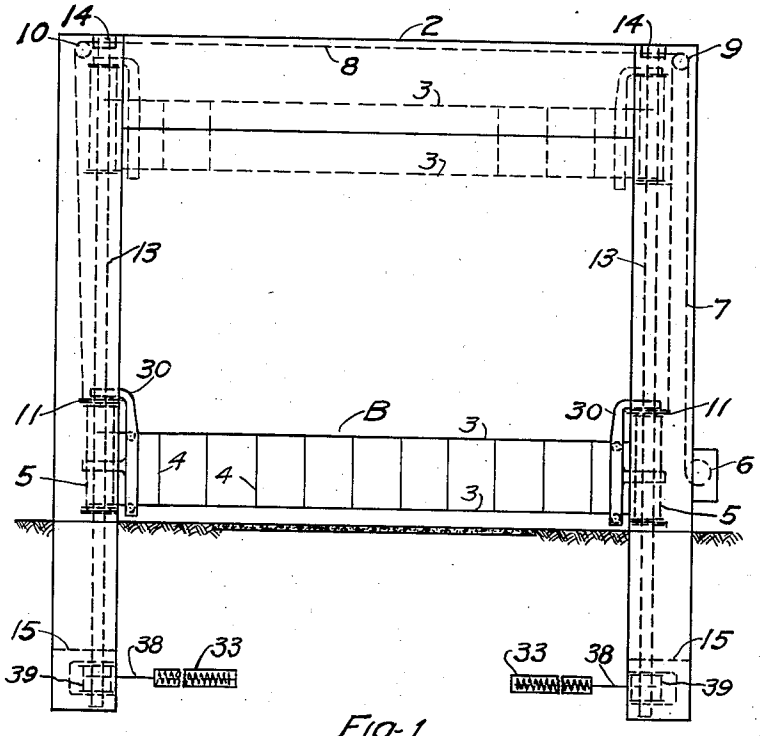


Fig-1

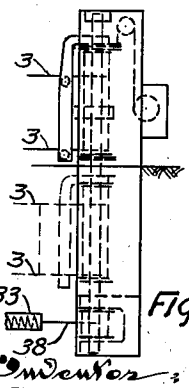


Fig-9

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HIGHWAY BARRIER

Filed April 25, 1938 2 Sheets-Sheet 2

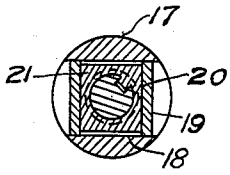


Fig.-8

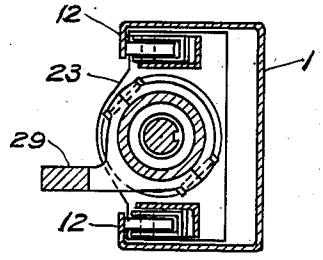


Fig.-7

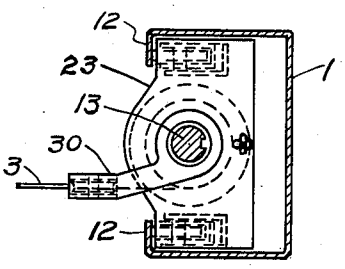


Fig.-6.

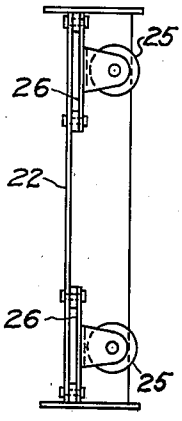


Fig.-5

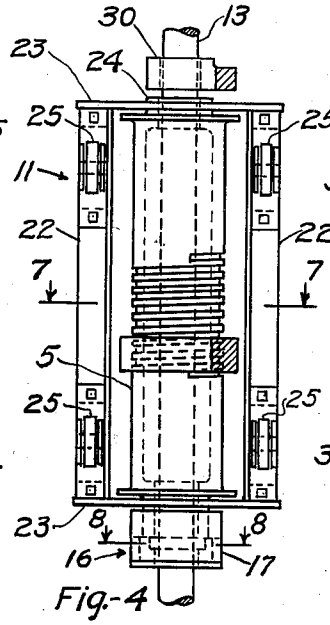
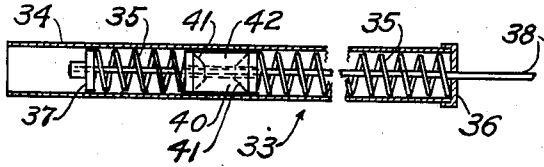


Fig.-4



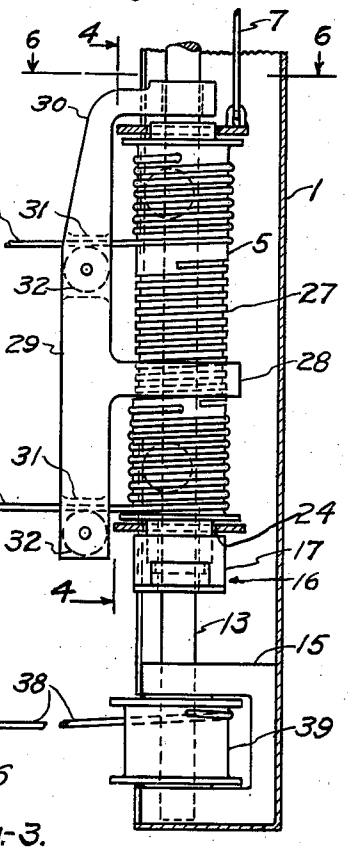


Fig.-3.

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HIGHWAY BARRIER

Theodore Ray Minert, Milwaukee, Wis.

Application April 25, 1938, Serial No. 204,072

14 Claims. (Cl. 39—1)

This invention relates to barriers and refers particularly to highway barriers of the type designed to stop a vehicle moving along the highway, without injury to the vehicle or its occupants. The invention is thus particularly suitable for use at railway crossings.

Barriers of this class generally comprise a suitable supporting structure between which the barrier per se is mounted for vertical movement to and from an operative position. Generally, the mechanism for raising and lowering the barrier is automatically controlled by the approach of the train.

The barrier per se is so constructed that when a vehicle strikes it, it is brought to a gradual stop. The shock of the impact is cushioned by paying out the flexible barrier against the opposition of a yielding retarding device.

Considerable difficulty has been experienced with past constructions for the reason that the pay out device was connected with the barrier per se in such a way that stress due to impact was transmitted to the raising and lowering mechanism. These past constructions were also subject to the objection of an exceptionally large number of moving parts and comparatively complicated design.

Another very serious disadvantage of past constructions resided in the fact that the structure to be raised and lowered was comparatively heavy.

With these and other objections to past and existing highway barriers in mind, this invention has as one of its objects to provide a barrier of this type which is simple in construction and which involves but very few parts.

Another object of this invention is to provide a highway barrier so constructed that the barrier per se may be raised and lowered without in anywise disturbing the retarding or resisting means.

A further object of this invention is to provide a highway barrier of the character described wherein the force of an impact is carried directly by the fixed supporting columns and without in anywise imposing strain upon the raising and lowering mechanism or any of the other driving instrumentalities.

Another object of this invention is to provide a highway barrier of the character described which is adaptable to below grade construction.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a front view of a highway barrier constructed in accordance wtih this invention;

Figure 2 is a plan view showing the relative positions of the barrier with an intersecting railroad and highway, and also showing the manner in which the barrier per se is extended by a vehicle striking the same;

Figure 3 is a detail view illustrating the mechanism for paying out the barrier, and the manner in which such paying out is yieldingly opposed;

Figure 4 is a detail sectional view taken through Figure 3 on the plane of the line **4—4**;

Figure 5 is a side view of the frame of one of the paying out devices;

Figure 6 is a cross sectional view taken through Figure 3 on the plane of the line **6—6**;

Figure 7 is a cross sectional view taken through Figure 4 on the plane of the line **7—7**;

Figure 8 is a detail sectional view taken on the plane of the line **8—8** in Figure 4; and

Figure 9 is a front view of one end of a modified embodiment of the invention to illustrate its adaptability to below grade construction.

Referring now particularly to the accompanying drawings, the numeral **1** designates upright supporting columns, one at each side of the highway, which, together with an overhead horizontal cross member **2** joining the upper ends of the supporting columns, constitutes a main supporting frame. A flexible barrier B extends across the space between the columns for movement from an overhead out of the way position, shown in dotted lines in Figure 1, to an operative position across the roadway, shown in full lines in Figure 1.

The flexible barrier may be constructed in many different ways, but preferably comprises two horizontal cables **3** joined by a number of vertical ties **4**. The ends of the cables are attached to and wound on pay out spools **5**. These pay out spools, as will be hereinafter more fully described, are mounted to move vertically along the columns to carry the barrier to and from its operative position. The cables **3** are of sufficient length

and have sufficient reserve wound on the spools to allow the vehicle to move forwardly a substantial distance after striking the barrier.

To raise the barrier B to its overhead position, an electric motor and a suitable drum mechanism, indicated generally by the numeral 6, is provided. Cables 7 and 8 having one end wound up on this drum mechanism, are trained over sheaves 9 and 10, respectively, mounted at the upper ends of the columns and have their free ends connected to frames 11 which carry the pay out spools for vertical motion within the columns.

The mechanism in the two columns is identical. Hence, a description of one will suffice for both.

The supporting column, as best shown in Figures 6 and 7, is of hollow substantially rectangular construction with the inner wall thereof centrally cut away to provide a slot bounded by guide flanges 12. Extending longitudinally throughout the height of the column is a rotatable shaft 13, the upper end of the shaft being journalled in a bearing 14 and the lower end thereof being stepped in a bearing 15. A keyway extends along the length of the shaft for at least the extent of the vertical motion of the barrier.

The pay out spool 5 is slidable along the shaft 13 and is nonrotatably connected thereto through a flexible coupling 16. This flexible coupling provides the desired nonrotatable but freely slidable driving connection between the spool and the shaft, while allowing the spool to move laterally with respect to the shaft a limited distance for a purpose to be hereinafter described, it being understood that the bore through the spool is sufficiently large to accommodate such sidewise shifting thereof.

The flexible coupling 16 may be of any suitable construction, and in the present instance, consists of a hub-like member 17 rigidly joined to the spool 5 and provided with a diametrically extending cross slot 18 in which a block 19 is slidably disposed. The block 19 in turn has a cross slot 20 arranged at right angles to the slot 18 to receive a square block 21, and the block 21 is slidably splined to the shaft, as shown in Figure 8.

The frame 11 which carries the spool 5 has spaced parallel side rails 22 connected at the top and bottom by cross members 23, both of which rotatably receive trunnions 24 on the ends of the spool. Each side rail of the frame carries two guide rollers 25 mounted on the spring blades 26. The normal tension of the barrier holds the rollers in engagement with the guide flanges 12 on the column and as long as the strength of the spring blades 26 is not exceeded, the spool 5 is held coaxially disposed with respect to the shaft 13. However, when the barrier is struck by a vehicle, the additional tension on the barrier overcomes the resiliency of the spring blades 26 and allows the side rails of the frame to engage the guide flanges 12 directly so that the force of the impact is transmitted to the column without imposing strain upon the shaft 13.

As best illustrated in Figures 3 and 4, the spool has smooth end portions on which the cables 3 are wound, and a central threaded portion 27. Engaging this threaded portion is an internally threaded arm 28 forming part of a cable guide 29, the upper end of which forms a bracket arm 30 which is bored to slidably engage the shaft 13. At properly spaced points, the guide 29 has cable ports 31 and idler rollers 32 to properly guide the cables as they are payed out and retrieved.

When a vehicle strikes the barrier and the reserve length of the cables is paid out off the spools 5, both of the shafts 13 are rotated in a direction opposed by retarding means, indicated generally by the numeral 33, mounted below grade and connected with the shafts. These retarding means comprise elongated cylinders 34 mounted in fixed horizontal positions and enclosing sections of the coil springs 35.

One end of each series of coil springs bears against a cap 36 closing the end of the cylinder adjacent to the shaft 13 for which that particular retarding device is provided, and the opposite end of the series of coil springs has a head 37 bearing thereagainst to which the end of a cable 38 is secured. Hence, a pull on the cable 38 compresses the spring sections.

The free ends of the cables 38 are fixed to spools 39 non-rotatably mounted on the lower ends of the shafts 13.

The direction of reeving of the cables 38 on the spools 39 is opposite to that of the cables 3 on the spools 5 so that when the cables 3 are unwound from the spools 5, the cables 38 are wound up on the spools 39 to compress the coil springs, as will be readily apparent.

The opposition force of the coil springs of each retarding device may be augmented by a brake 40 consisting of two cones 41 positioned apex-to-apex with their bases engaging the adjacent ends of two sections of coil springs and having brake shoe segments 42 interposed therebetween to be spread radially into frictional contact with the inner wall of the cylinder upon endwise approach of the cones 41. These brakes, in addition to augmenting the opposition force of the springs, also offer enough resistance to free motion thereof along the cylinders to insure a cushioned return of the barrier to its normal position.

While the construction shown as a preferred embodiment of this invention is of the overhead type wherein the barrier in its inoperative position is elevated, it will be readily apparent that this invention is also capable of below grade construction. This embodiment of the invention is illustrated in Figure 9.

In this case, all of the mechanism is identical to that described, but the columns instead of projecting a substantial distance above grade are only high enough to enable the barrier to be raised from a trough or pit extending transversely across the highway through a suitable trap door (not shown) to its operative position across the roadway.

The manner in which impact is resisted and the barrier paid out is exactly the same as that described, and likewise, the manner in which the pay out spools and the barrier are elevated may be the same as that described.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides a commercially practical highway barrier particularly adapted for use at highway-railroad intersections.

What I claim as my invention is:

1. In a device of the character described: a flexible barrier mounted to move vertically to and from its operative position; a pay out device movable with the flexible barrier; stationarily mounted retarding means; and driving connections between the pay out device and the retard-

ing means, said driving connections including a vertical rotatable shaft having a vertically movable driving connection with the pay out device so that the driving connections remain regardless of the position of the barrier and pay out device.

2. In a device of the character described: two spaced upright supports; a rotatable shaft mounted vertically from each support; a pay out device slidable along each support and having a sliding driving connection with the adjacent rotatable shaft; a flexible barrier extending between the supports with its opposite ends connected to the pay out devices; and retarding means permanently connected with said rotatable shafts.

3. In a device of the character described: two spaced upright supports; a rotatable shaft mounted vertically from each support; a pay out device slidable along each support and having a sliding driving connection with the adjacent rotatable shaft; a flexible barrier extending between the supports with its opposite ends connected to the pay out devices; retarding means permanently connected with said rotatable shafts; and means for moving the barrier and the pay out devices vertically along the supports to and from an operative position.

4. A device for stopping vehicles moving along a highway comprising: fixed supports at opposite sides of the highway, said fixed supports providing vertical guideways; a vertical rotatable shaft carried by each of said fixed supports; pay out spools slidable along the guideways and having axially slidable but nonrotatable driving connections with the shafts; a flexible barrier extending between said supports and having its opposite ends wound on said pay out spools; and retarding means connected with the rotatable shafts to oppose unwinding of the barrier from said pay out spools.

5. A device for stopping vehicles moving along a highway comprising: fixed vertical guideways at opposite sides of the highway; vertical rotatably mounted shafts adjacent to the guideways; pay out spools movable along said guideways and having axially slidable but nonrotatable driving connections with the rotatable shafts; a flexible barrier extending across the highway with its ends wound on the pay out spools; and retarding means mounted below grade and connected with the rotatable shafts for retarding the unwinding of the barrier ends off the pay out spools.

6. A device for stopping vehicles moving along a highway comprising: a fixed upright guideway on each side of the highway; a flexible barrier extending between the guideways; means slidable along said guideways and having the ends of the flexible barrier attached thereto; one of said last named means at least constituting a pay out device having a spool on which the adjacent end of the flexible barrier is wound; a vertically disposed rotatable shaft parallel to the adjacent guideway; means providing an axially slidable but nonrotatable driving connection between the pay out spool and the rotatable shaft; and retarding means connected with the rotatable shaft to oppose unwinding of the flexible barrier off the pay out spool.

7. A device for stopping a vehicle moving along a highway comprising: upright supporting columns at opposite sides of the highway; a flexible barrier extending between said columns; pay out devices vertically movable along the columns and having the ends of the flexible barrier attached thereto; means for raising and lowering said pay out devices along the columns; retarding means providing opposition to the paying out of the flexible barrier by the pay out devices; and driving connections between the pay out devices and the retarding means enabling vertical movement of the barrier and the pay out devices without disturbing the retarding means, including a vertical shaft rotatably supported by each of said supporting columns and having a vertically movable driving connection with said pay out devices.

8. A device for stopping a vehicle moving along a highway comprising: an upright support at each side of the highway, each support having vertical guide means; a pay out device movable along each guide means; a flexible barrier extending across the space between the supports and having its opposite ends wound on said pay out devices; retarding means for opposing the unwinding of the barrier ends off the pay out devices; a vertical shaft rotatably carried by each support; driving connections between the retarding means and the shafts; and free sliding driving connections between the pay out devices and the shafts, said last named connections including flexible couplings to allow lateral shifting of the pay out devices into firm engagement with the guideways without imposing lateral stress on the vertical shafts.

9. In a device of the character described: an upright hollow column having a vertical slot bounded by guide flanges; a rotatable shaft mounted vertically within the hollow column; a spool slidably splined to the rotatable shaft through a flexible coupling enabling a degree of lateral motion of the spool with respect to the shaft; a guide carriage connected with the spool and disposed within the hollow column; resilient means carried by the carriage and engaging the guide flanges for normally holding the carriage and the spool in coaxial relationship with the shaft; a flexible barrier having a part wound on said spool and adapted when struck to be unwound therefrom and to draw the spool and its carriage against the guide flanges; retarding means connected with the shaft to oppose unwinding of the barrier off the spool; and means for moving the spool and its carriage vertically along the column.

10. In a device of the character described: a vertical shaft rotatably mounted; a spool movable along the shaft, the bore of the spool being large enough to permit the same to shift laterally with respect to the shaft; a flexible barrier having an end received on the spool; a flexible coupling slidably drivingly connecting the spool with the shaft; a fixed guideway alongside the shaft; a carrier connected with the spool; and means on the carrier riding on the guideway to normally hold the spool coaxially with respect to the shaft.

11. In a device of the character described: a vertical shaft rotatably mounted; a spool movable along the shaft, the bore of the spool being large enough to permit the same to shift laterally with respect to the shaft; a flexible barrier having an attaching and wound on the spool; a flexible coupling slidably drivingly connecting the spool with the shaft; a fixed guideway alongside the shaft; a carrier connected with the spool; and means on the carrier riding on the guideway to normally hold the spool coaxially with respect to the shaft, said last named means being yieldable to enable direct contact of the carrier with the guideway so that a side thrust imparted to the

spool may be transmitted directly to the guideway.

12. In a device of the character described: a vertical shaft rotatably mounted; retarding means connected with the shaft to yieldingly oppose rotation of the same in one direction of rotation; a spool slidable along the shaft; a flexible barrier having an end wound on the spool, the bore in the spool through which the shaft passes being large enough to allow limited lateral movement of the spool with respect to the shaft; a flexible coupling drivingly connecting the spool with the shaft while enabling lateral shifting of the spool with respect to the shaft; rigid vertical guide means alongside the shaft; a rigid carrier for the spool; and resiliently mounted tracking members on the carrier engaging the guide means to normally hold the spool coaxially with respect to the shaft, said tracking means yielding upon the application of side thrust on the spool as by an object striking the flexible barrier to enable direct engagement of the frame with the rigid guide means so that the force of impact is carried by the guide means to leave the shaft free to turn against the opposition of the retarding means.

13. In a highway barrier of the character described: a rigid support; a rotatable shaft vertically mounted from said support; a flexible barrier movable to a position across a highway, said barrier having an attaching end portion; means slidable on the shaft receiving the attaching end portion of the barrier for paying out the barrier upon being struck by a vehicle; retarding means connected through the shaft with the pay out means for opposing the paying out of the barrier, said retarding means comprising a cylinder, spaced sections of coil springs in the cylinder adapted to be endwise compressed, and an expanding brake interposed between adjacent sections of coil springs to be expanded upon compression thereof into frictional engagement with the inner wall of the cylinder.

14. A highway barrier of the character described comprising: an upright supporting column on each side of the highway with part thereof projecting above grade and part thereof extending below grade; pay out devices slidably mounted on said supports; means for simultaneously effecting vertical movement of said pay out devices from positions below grade to operative positions above grade; a flexible barrier carried by said pay out devices adapted to be carried up to its operative position across the highway from an excavation below grade; retarding means below grade operable to oppose the paying out of the flexible barrier by said pay out devices, and a driving connection between the retarding means and the pay out devices including a vertical rotatable shaft supported by each of said supporting columns and slidably drivingly connected with said pay out devices.

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