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CABLE RELEASE LEVER

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(54) **CABLE RELEASE LEVER**

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Related U.S. Application Data

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E01F 15/00 (2006.01)
E01F 13/00 (2006.01)

(52) **U.S. Cl.** **256/13.1**; 404/6

(58) **Field of Classification Search** ..... 256/13.1; 439/504; 404/6; 24/68 FP

See application file for complete search history.

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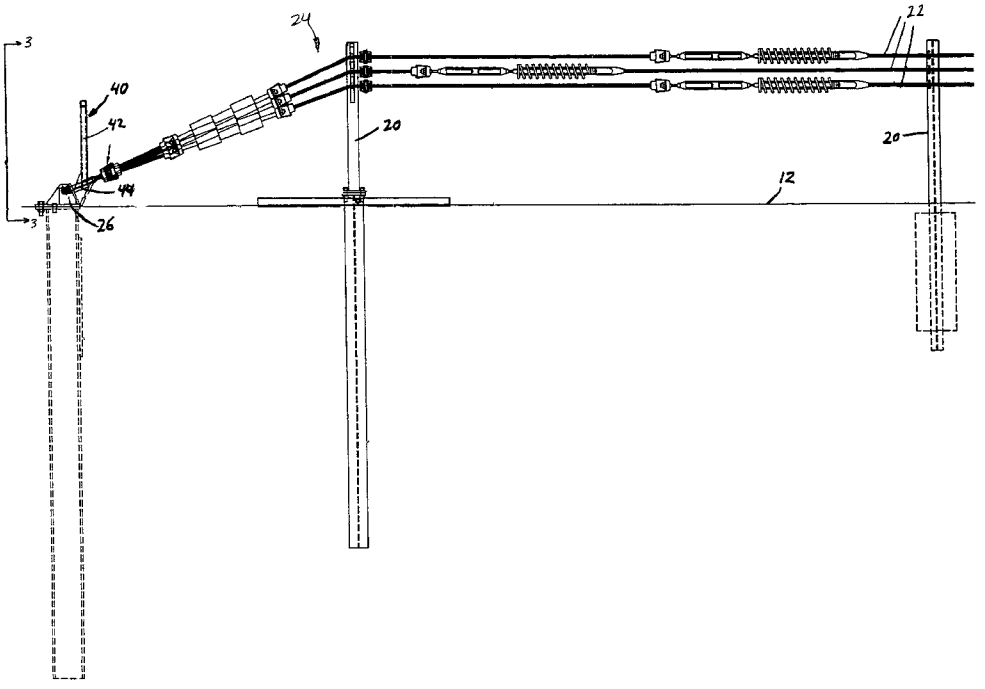
(57) **ABSTRACT**

A system and method for a device for releasing a cable of a safety system is disclosed. The system and method disclose various features of the cable system as it applies to a roadway barrier system and other applications in the event that the cables are impacted generally longitudinally proximate the region they are secured to a surface.

13 Claims, 7 Drawing Sheets



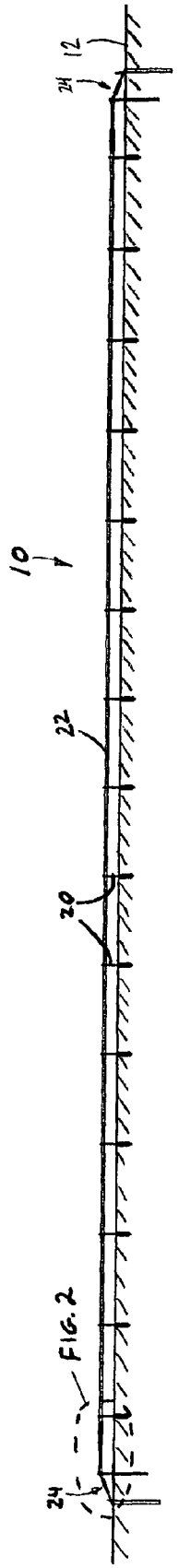


FIG. 1A

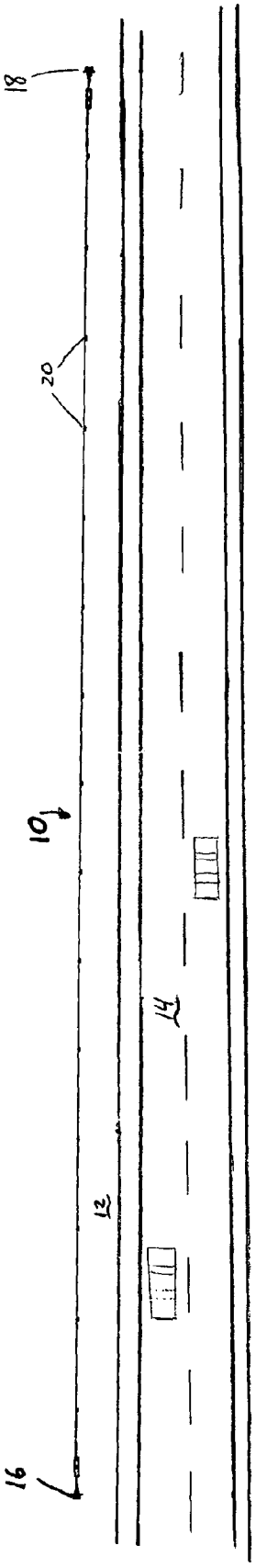


FIG. 1B

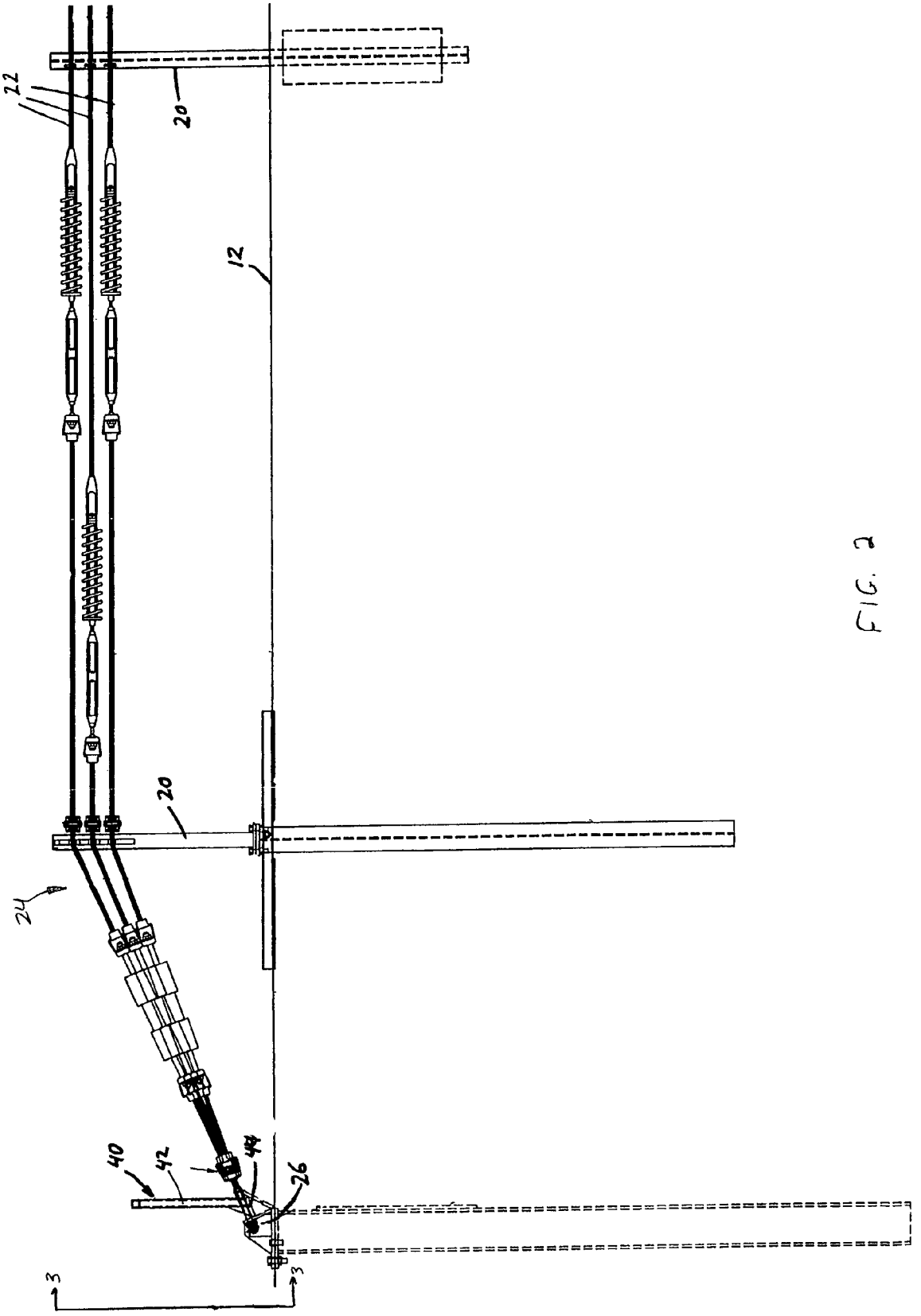


FIG. 2

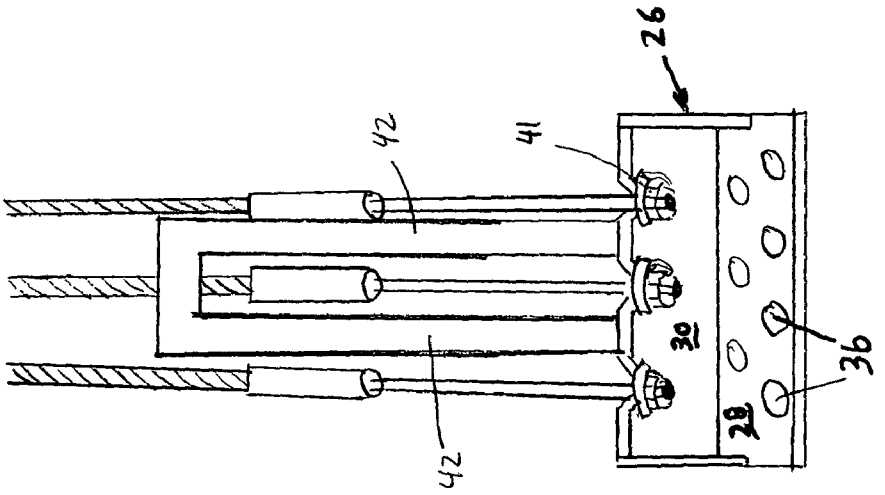


FIG. 3

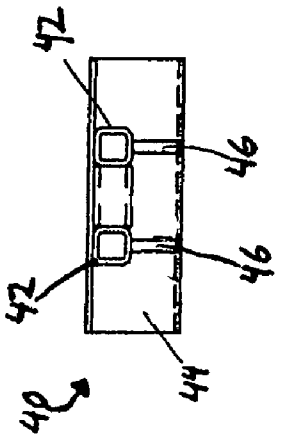


FIG. 4C

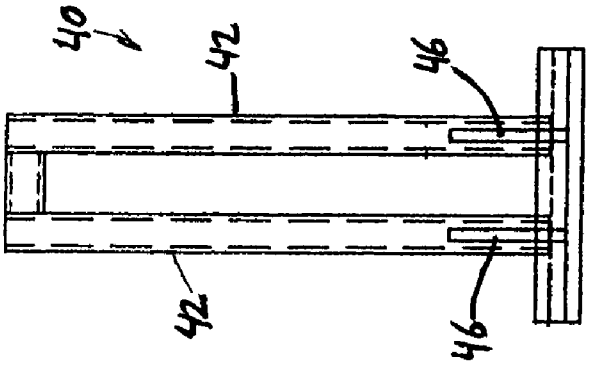


FIG. 4A

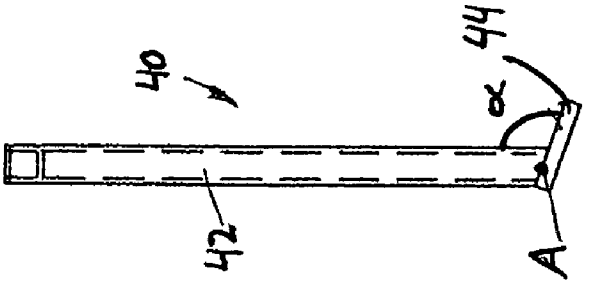


FIG. 4B

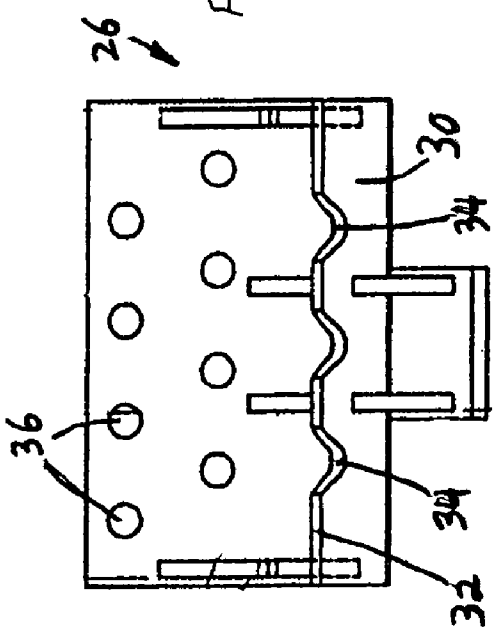


FIG. 5C

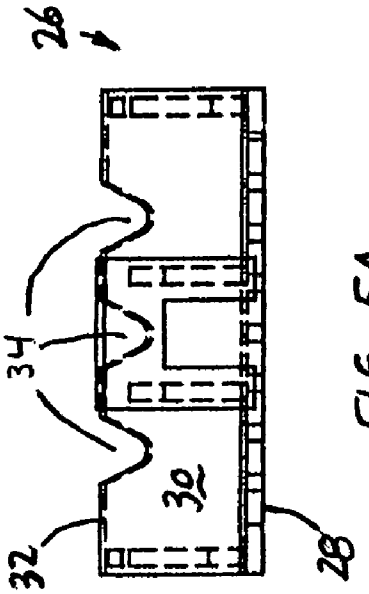


FIG. 5A

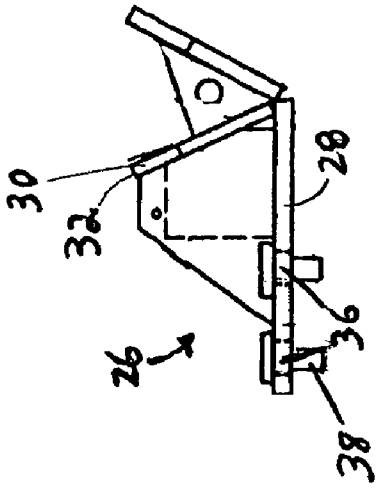


FIG. 5B

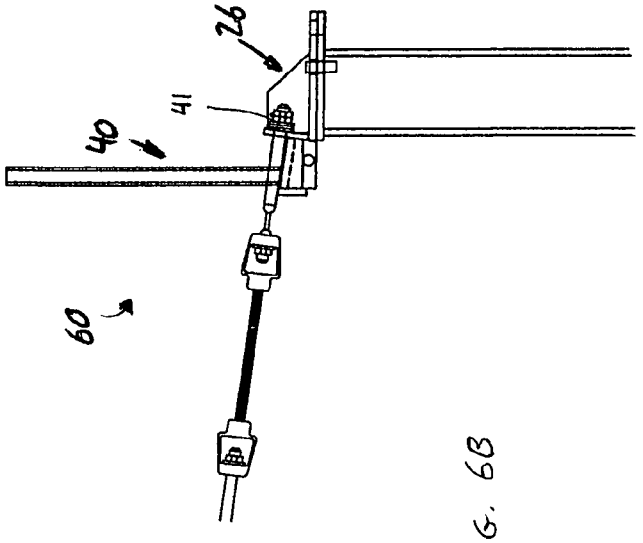


FIG. 6B

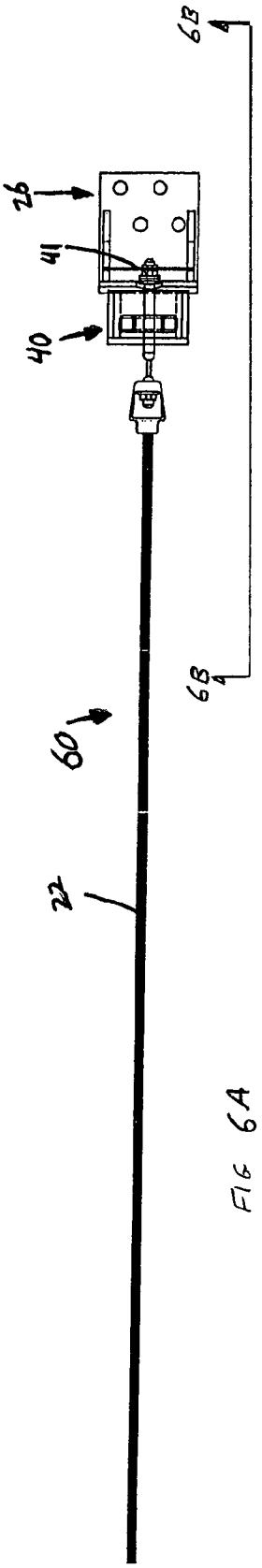


FIG 6A

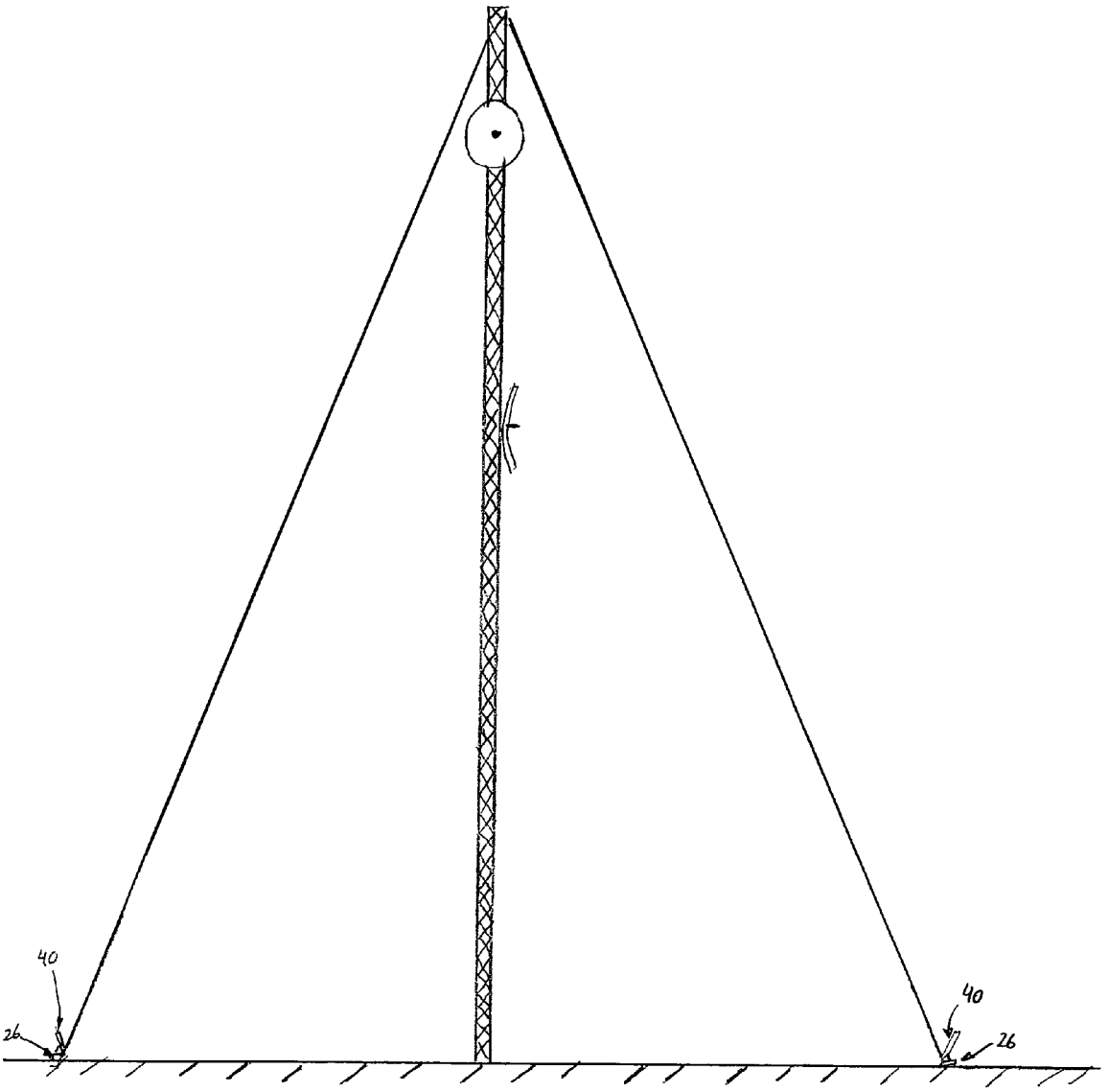


FIG. 7

CABLE RELEASE LEVER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application Ser. No. 60/628,213 filed on Nov. 16, 2004.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

BACKGROUND

Cable systems have often been used as safety systems for roadside barriers or as tie-down measures for securing equipment such as antennas, towers, or safety fences/netting. Using cable systems for these purposes requires that the cables be maintained in constant tension and not break loose. If not, they would fail as a securing mechanism. The cable used in these systems is typically manufactured from heavy gauge steel wire, rated to maintain a desired loading. Unexpected failure of the cable safety system can result in significant property damage to the item being secured, as well as potential injury or fatality to bystanders.

Prior art mechanisms that release a cable from its anchor have traditionally relied on the fracture of a post or support. In these mechanisms, the cable is passed through the base of a post such that when the post fractures on impact, the cable is freed from its anchor.

As previously mentioned, roadside barriers have been known to use cable safety systems as guardrails. In such an arrangement, at least one cable is supported by relatively weak steel posts. The steel cables are pre-tensioned with an initial load, and are anchored at both ends of the system. The anchoring typically occurs along a surface such as the roadside or ground. When an errant vehicle obliquely impacts the system, which is most commonly a three cable system, the cables have sufficient tension in them to absorb the impact and redirect the vehicle back towards the driving surface, effectively shielding the roadside hazard and increasing the safety of the vehicle operator. This is especially important on roads that do not have other types of barriers that could perform similar functions (i.e. curbs, concrete walls). Numerous fatalities and injuries have been attributed to vehicles leaving the road and either rolling or entering opposing traffic lanes, thereby potentially endangering other motorists, as well as the occupants of the errant vehicle. The support posts alone offer very little resistance to the impacting vehicle.

While these conventional systems have proven successful, they also possess shortcomings. For example, these systems are typically employed where deemed necessary by traffic officials or government regulations. As a result, they are not used along all roadsides, but instead in sections. At the ends of these sections, the cables are anchored to the surface. Accordingly, the cables taper from their maximum height between the support posts to their minimum height at the surface. Since these conventional cable systems are not designed to give way, a vehicle striking the cable system longitudinally, or in line with the taper of the cables, is likely to ride up the tapered cables and initiate a rollover, thereby causing serious damage to the vehicle and severe, if not fatal, injuries to any passengers. This has become a more prevalent event as more roadside cable systems are now being installed with ends tangent to the roadway, instead of being flared away from it.

SUMMARY

The present invention is defined by the claims below. Embodiments of the present invention solve at least the above problems by providing a system and method for a device for releasing a cable of a safety system. The system and method disclose various features of the safety system as it applies to a roadway barrier system and other applications in the event that the cables are impacted proximate the region they are secured to the surface.

In a first aspect, a device for releasing a cable is disclosed comprising primarily an anchor bracket and a release lever. The release lever is located proximate the anchor bracket such that the release lever can pivot, upon impact of a load, to disengage one or more cables from the anchor plate.

In a second aspect, a device for releasing tension within a roadside safety system is disclosed. This system incorporates the aspects of an anchor bracket and release lever as previously described, but also includes other features of a roadside safety system such as vertically extending support posts, one or more cables extending between the support posts, and end terminals.

In a third aspect, a method of releasing one or more cables of a safety system is disclosed. This method discloses the steps necessary to release the one or more cables. This method is applicable to a variety of cable safety systems, including, but not limited to a roadside safety system.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Illustrative embodiments of the present invention are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

FIG. **1**A is a side elevation view of a roadside safety system in accordance with an embodiment of the present invention.

FIG. **1**B is a top elevation view of a roadside safety system in accordance with an embodiment of the present invention.

FIG. **2** is an side elevation view of an end terminal and cable release device in accordance with an embodiment of the present invention.

FIG. **3** is an end elevation view of the cable release device in accordance with an embodiment of the present invention.

FIGS. **4**A, **4**B, and **4**C are various views of a release lever in accordance with an embodiment of the present invention.

FIGS. **5**A, **5**B, and **5**C are various views of an anchor bracket in accordance with an embodiment of the present invention.

FIGS. **6**A and **6**B are top elevation and side elevation views, respectively, in accordance with a single cable embodiment of the present invention.

FIG. **7** is a side elevation view of a cable release device in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

Embodiments of the present invention provide systems and a method for releasing a cable of a safety system. Under certain circumstances, it may be necessary to release a cable, in tension, that is otherwise intended to serve as a safety system. Under these circumstances, it is desirable to provide such a system and method that is relatively simple, reliable, and reusable.

Referring now FIGS. **1**A and **1**B, a roadside safety system **10** in accordance with the present invention is shown in detail. FIG. **1**A shows a side elevation view of safety system **10**

along a surface **12**. FIG. **1**B shows a top elevation view of roadside safety system **10** adjacent a two-lane road **14**. Roadside safety system **10** can be secured to a surface **12**, which may be the ground, or asphalt/concrete covered shoulder of road **14**. The exact location varies and typically depends on the surrounding terrain and available property. As previously mentioned, roadside safety systems, such as the one depicted in FIGS. **1**A and **1**B, have ends, **16** and **18** respectively, and also a plurality of vertically extending support posts **20**. Extending between support posts **20** are one or more cables **22**, which are preferably constructed of steel. In the illustrated embodiment of the invention, three cables are utilized. The cables are anchored at ends **16** and **18** to surface **12**. Further understanding of this transition region and anchoring region is shown in FIG. **2**.

One feature depicted in FIG. **2** is an end terminal **24**. It is at this location that cables **22** are directed towards an anchor plate **26** which is itself fixed to surface **12**. As can be seen in FIG. **2**, anchor plate **26** and support posts **20** are secured beneath surface **12** in order to provide the necessary structural support to absorb the load caused by a vehicular impact as well as to maintain the cables in tension. End terminals **24** are positioned at each end of safety system **10** as shown in FIG. **1**A.

Referring now to FIGS. **3**-**5**C, additional aspects of the present invention are disclosed in greater detail. An anchor bracket **26** comprises a base portion **28** and an end plate **30** that extends generally vertically from base portion **28** and has an upper edge **32**. One or more slots **34**, designed for receiving one or more cables **22** in tension, are positioned in end plate **30**, along upper edge **32**. The cables secured in slots **34** are shown in FIG. **3**. Base portion **28** also has a plurality of openings **36** for securing anchor bracket **26** to surface **12**. This securing is accomplished by a plurality of fasteners **38** (see FIG. **5**B).

Another feature of the safety system is a release lever **40** which comprises at least one first leg **42** that is secured to a second leg **44**. In the embodiment shown in FIGS. **3**-**4**C, at least one first leg **42** comprises two generally parallel legs. Second leg **44**, which is shorter than first leg **42**, is positioned at an angle α relative to first leg **42**. In order to minimize the time required for the release of cables **22** from the time of impact of lever **40**, it has been determined that the angle α should be only slightly obtuse—approximately 90-105 degrees. To provide additional structural support to lever **40**, the lever further comprises a plurality of gussets **46** that reinforce said first and second legs.

Release lever **40** is positioned proximate said anchor bracket **26** such that release lever **40** can pivot to disengage one or more cables **22** from anchor plate **26** by releasing nuts **41** from slots **34**. In the example of a roadside safety system, upon impact with first leg **42**, lever **40** pivots about a point A (see FIG. **4**B) thereby raising second leg **44** to a height sufficient to raise ends of cables **22** from slots **34** in end plate **30**. Once the cables are raised to the point that their securing means, E.g. nuts **41**, clear slots **34**, the contraction of the one or more cables **22** from its built-in tension allows the cables to collapse.

The means by which the collapse of cables **22** for a roadside safety system is possible is by means of a vehicle striking lever **40** at first leg **42**. Depending upon the type of vehicle, most likely it will be the vehicle bumper which will strike first leg **42**. After the cables **22** become disengaged from anchor plate **26**, due to a vehicle striking lever **40**, support posts **20** will breakaway from surface **12** as they are impacted by the vehicle.

While the system described up to this point, that provides the best understanding of the present invention, has been a roadside safety system, the present invention is not intended to be limited to that type of technology. On the contrary there are other fields in which a cable safety system is utilized, such as a mechanism for releasing securing cables for other structures. For example, with reference now to FIGS. **6**A, **6**B, and **7**, a single-cable safety system **60** is shown in detail. In this arrangement, the same features as described above are utilized herein, including lever **40** and anchor plate **26**. However, in this arrangement only, a single cable **22** is required. This type of cable safety system can be utilized for securing vertically extending structures, such as antennas, radio towers, safety fencing, etc. An example of such an arrangement is shown in FIG. **7**. The lever in such a system is similar to the one shown in FIGS. **1**-**6** except that it only requires one slot.

The present invention also provides a method of releasing one or more cables of a safety system comprising the steps of providing an anchor bracket and a release lever as previously disclosed and impacting the release lever. The impact on the release lever causes a pivoting of the release lever such that the second leg of the lever pushes the ends of the one or more cables out of the slots in the anchor bracket, thereby releasing the tension in the one or more cables.

This method is applicable to a variety of cable safety system applications including a roadside safety system as well as the other applications previously discussed such as antennas, radio towers, fencing, to name a few generally vertically extending structures often requiring securing mechanisms.

This system and method as it applies to roadway safety systems was simulated and tested through careful experimentation by the inventors. Through computer simulations and scaled testing, they were able to verify that the cable ends of a three-cable system would properly release from an anchor bracket upon longitudinal impact of a moving vehicle (at approximately 45 mph), thus eliminating the tension in the cables and preventing the vehicle from climbing the inclined cables proximate the end terminal. For the system tested, it was determined from photographic evidence that the cables were released from the anchor bracket approximately 8 milliseconds after the vehicle impacted the first leg of the release lever. Significant reduction in cable tension was seen by approximately 18 milliseconds after vehicle impact. In this scaled testing, the release lever incorporated an angle α between its first leg and second leg of approximately 97.5 degrees. Reductions in vehicular velocity were detected at impact with the releasing lever as well as with each support post. Although the support posts did slow the vehicle they provide minimal resistance to an impact load and typically fractured.

Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present invention. Embodiments of the present invention have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art that do not depart from its scope. A skilled artisan may develop alternative means of implementing the aforementioned improvements without departing from the scope of the present invention.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. Not all steps listed in the various figures need be carried out in the specific order described.

The invention claimed is:

1. A roadside safety system comprising: a plurality of vertically extending support posts placed along a surface; one or more cables extending between said support posts; and a cable release device; said cable release device further comprising:

an anchor bracket comprising a base portion and an end plate having one or more slots positioned therein, said slots for receiving one or more cables;

a release lever comprising at least one first leg coupled to a second leg, said second leg positioned at an angle relative to said first leg; and,

wherein said release lever is positioned proximate to said anchor bracket such that a lateral force applied to said first leg is translated to a vertical force applied to said one or more cables by said second leg at a point distal to said first leg.

2. The roadside safety system of claim **1** wherein said one or more cables received in said slots are in tension.

3. The roadside safety system of claim **1** wherein said end plate extends in a generally vertical direction from said base portion.

4. The roadside safety system of claim **3** wherein said slot in said end plate is located along an upper edge of said end plate.

5. The roadside safety system of claim **1** wherein a plurality of fasteners extend through said openings for securing said anchor bracket to said surface.

6. The roadside safety system of claim **1** wherein said angle .alpha. is approximately 90-105 degrees.

7. The roadside safety system of claim **6** wherein said first leg is longer than said second leg.

8. The roadside safety system of claim **1** wherein said release lever further comprises a plurality of gussets for reinforcing said first and second legs.

9. The roadside safety system of claim **1** wherein said one or more cables are steel.

10. The roadside safety system of claim **1** wherein said support posts fracture upon impact of a vehicle.

11. The roadside safety system of claim **1** wherein said one or more cables are released from said anchor plate shortly after impact of a vehicle with said at least one first leg of said release lever.

12. The roadside safety system of claim **11** wherein said one or more cables comprises three cables.

13. The roadside safety system of claim **1** further comprising:

an end terminal located proximate said anchor bracket for directing said one or more cables in tension towards said anchor bracket.

* * * * *