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BREAKAWAY BASE SUPPORT FOR ROADSIDE STANDARDS

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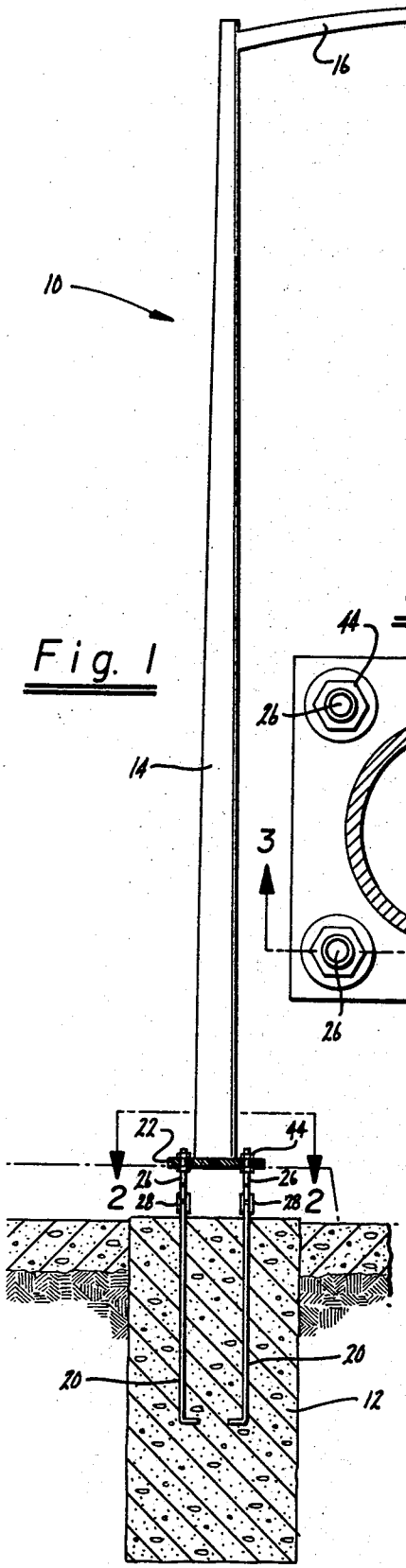


Fig. 1

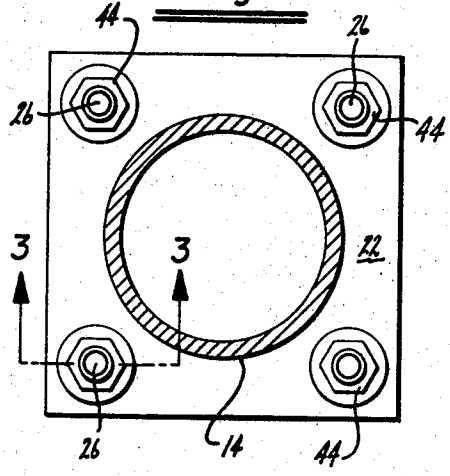


Fig. 2

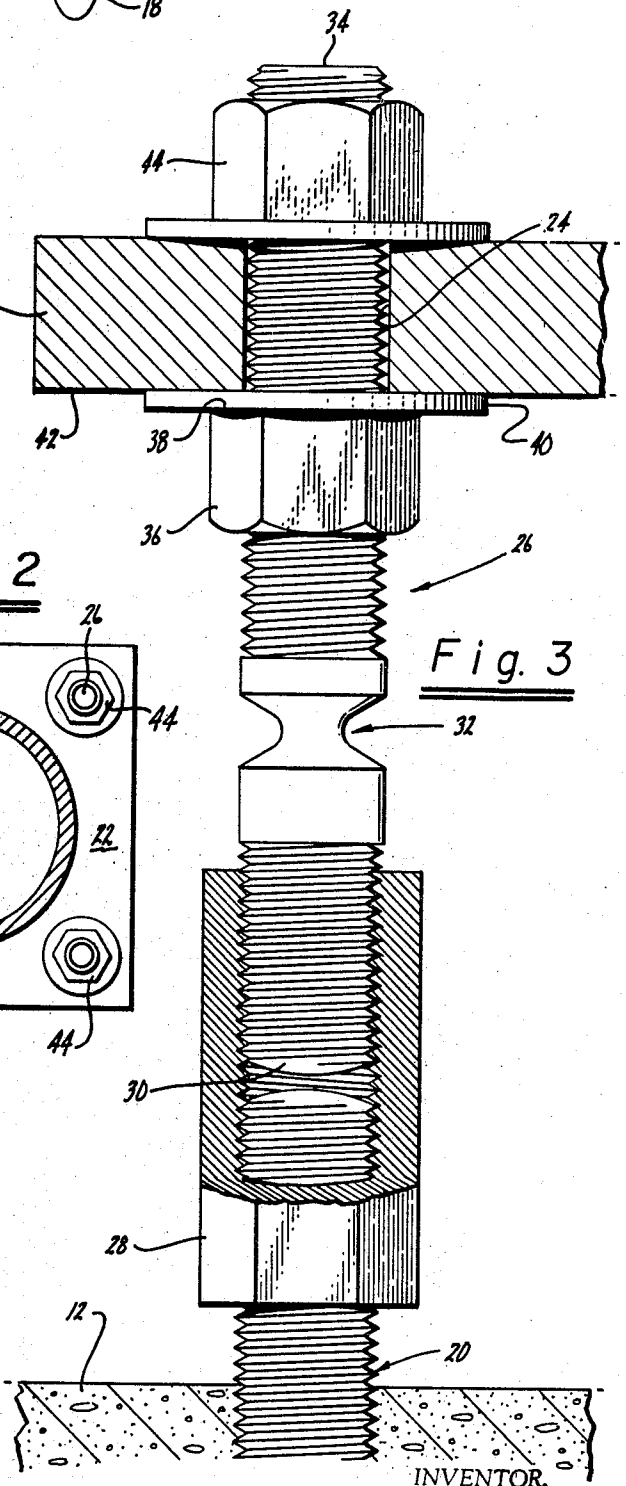


Fig. 3

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BREAKAWAY BASE SUPPORT FOR ROADSIDE STANDARDS

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ABSTRACT OF THE DISCLOSURE

A pole base support for carrying objects adjacent vehicular traffic bearing surfaces which breaks away when struck by a moving vehicle. The support includes elongated members mounted on studs projecting above the ground which have a cross sectional area fully capable of supporting the weight of the pole and the object as well as added loading occasioned by wind, ice, and other natural phenomena acting thereon; but which will break when subjected to lateral impact as produced by the collision force of a vehicle thereon.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to poles for placement adjacent traffic carrying surfaces on highways, streets, parking lots, etc., which are severed from their supporting surface when struck by a vehicle.

State of the prior art

Rigidly mounted poles such as lamp posts or traffic standards, for example, adjacent traffic carrying surfaces of streets and highways present serious hazards to vehicles over which control has been lost. Particularly adjacent high-speed freeways and overland routes, collisions between such vehicles and rigidly mounted poles can result in serious injuries or fatalities as well as in extensive property damage. In recognition thereof, poles have been constructed which break away from their foundation when struck by a moving vehicle.

Several such constructions are found in the prior art. In one of them, at least a lower portion of the post adjacent the foundation is constructed of a brittle concrete having a low impact resistance. Other designs utilize slip joints between the post and the foundation in which a horizontally acting force, such as a force from a striking vehicle, moves the post relative to its foundation until it becomes disengaged therefrom. It is also known to provide mounting screws or studs anchored in the foundation with an undercut to weaken them and permit their severance when the post is struck by a vehicle. In the latter instance the studs are, of course, constructed so that they can withstand forces from the weight of the post, the lamp or sign mounted thereon as well as wind loads acting on the post. Once the studs have been broken, new ones must be placed in the foundation before another pole can be erected at the site. If the foundation is of concrete and the studs are anchored in the concrete, which is the by far most convenient method for mounting posts adjacent streets and highways, the foundation must be replaced. This is not only expensive but also time consuming. During the time interval it takes to replace the foundation a needed light, traffic sign, etc. is absent, thereby creating a new traffic hazard.

Although the prior art break-away poles may be satisfactory once installed, they are relatively expensive to install and they are not adapted to convert rigidly mounted poles into safety break-away posts. Traditionally, rigidly mounted poles are formed with a base flange which is

mounted on a concrete foundation platform and bolted thereto by a plurality of studs cast in the concrete base. The flange is formed with openings spaced and dimensioned to receive the studs therethrough, and the assembly is secured by nuts threaded on the upper ends of the studs and clamping the flange to the concrete foundation. The large number of lighting poles, traffic signs, etc. presently existing and rigidly mounted makes it economically unfeasible to convert even a small percentage thereof into break-away posts constructed according to the prior art. Thus, the rigidly mounted poles together with the safety hazard they present, remain in place until they must be replaced due to their obsolecense, ill state of repair, damage from having been struck by a vehicle or roadway relocation.

SUMMARY OF THE INVENTION

The present invention provides means which are simple and inexpensive to manufacture for constructing break-away poles or standards for use adjacent vehicular traffic carrying surfaces such as freeways or highways, for example. It is also adapted for use with conventionally constructed rigid posts and foundations. Thus, it is adapted for erecting new poles as well as for converting existing, rigidly mounted poles into break-away poles.

Briefly, the present invention comprises elongated break-away members adapted to be secured to the upwardly projecting ends of studs anchored in the ground. The members have cross sectional areas which are capable of withstanding forces imparted upon them by the weight of the posts, signs or lamps mounted thereon as well as wind and ice loads acting on the post. The members are further constructed of a material having a relatively high tensile and compressive strength but a low impact strength so that a horizontally acting impact load will sever them and the pole breaks away from the foundation.

In the presently preferred form of this invention, the members are constructed of a heat treated steel. They are also made corrosion resistant, to prevent a gradual weakening of the reduced cross sectional areas and possible failure of the members under static loads. They are, therefore, preferably constructed of a corrosion-resistant material or their outer surfaces are suitably coated such as by plating or hot dip galvanizing.

Aside from the primary purpose of this invention of providing low-cost, yet most effective break-away highway posts and standards, it additionally provides an easy, low-cost installation of the pole.

Since break-away poles constructed in accordance with this invention employ poles and foundations constructed identically to presently installed rigid posts and standards, it is easy, inexpensive and, therefore, economically feasible to convert rigid poles into break-away poles. Accordingly, the present invention also provides a method for such a conversion. Briefly, the method includes the steps of disengaging the upright poles from its foundation and mounting the elongated member on the anchoring studs projecting from the foundation. Thereafter, the upright pole is lowered onto the elongated member and secured thereto. While the pole must be raised to enable the installation of the break-away members, it is normally not necessary to disconnect electric lines which may be connected to the top of the pole. Time consuming and high priced skilled labor is thereby saved. Thus, presently installed rigid lamp poles and traffic standards may be converted into break-away poles and standards rapidly and at relatively low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross sectional view of the break-away base support for lighting poles and the like constructed in accordance with the present invention.

FIG. 2 is an enlarged plan view, in section, taken on line 2—2 of FIG. 1; and

FIG. 3 is a fragmentary enlarged sectional view taken on line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a lamp pole **10** is anchored in its foundation block **12** and comprises an upright pole or standard **14**, an arm **16** extending transversely to the post and a lamp **18** secured to the outermost end of the arm. A plurality of anchor studs **20** project from the upper end of the foundation block and have their projecting ends externally threaded (see FIG. 3). The lower end of post **14** has a mounting flange **22** which includes mounting holes **24** (shown in FIG. 3) through which elongated break-away members **26** extend. An internally threaded sleeve **28** threadably engages the projecting end of the anchored studs and an externally threaded lower end **30** (best seen in FIG. 3) of the break-away members to thereby mount the lamp pole on the foundation block.

Referring to FIG. 3, in the presently preferred embodiment of this invention, each break-away member **26** includes an intermediate portion **32** which is recessed or grooved to reduce its cross sectional area. An upper end **34** of the member is externally threaded, preferably with a thread of the same size as that of lower end **30**.

Refering to FIGS. 1 through 3, the lamp pole is mounted on the foundation block by first securely threading a sleeve **28** onto the projecting end of each anchor bolt **20**. To provide for stability of the lamp post, at least three but preferably four, as shown in FIG. 2, anchor bolts are equally spaced from each other to coincide with the spacing of mounting holes **24** in mounting flange **22**. Next, a break-away member **26** is threadably engaged with each sleeve so that the intermediate portions **32** of the members are disposed upwardly of the sleeves. Nuts **36** are threaded over the upper end of the break-away members so that the lower end of the nuts is adjacent the portions of the members having the reduced cross sectional area. Upper faces **37** of the nuts are levelled with respect to each other until they lie in a common horizontal plane and washers **40** are slipped over the upper ends of the break-away members. The mounting holes in flange **22** of the lamp poles are aligned with the break-away members and the lamp poles and the mounting flange are lowered until a lower face **42** of the flange is supported by washers **40**. The mounting flange is now secured to the break-away members with upper nuts **44**.

After the lamp pole has so been installed on a foundation block adjacent a vehicular traffic bearing surface such as a roadway, it is subjected to wind loads acting on pole **14**, arm **16** and lamp **18**, as well as to loads from ice (not shown) that might cling to the lamp post. These forces are transmitted through the mounting flange to the break-away members. Simultaneously, the break-away members are subjected to forces from the weight of the pole, the arm and the lamp. Depending upon the direction and magnitude of the wind load, as well as on the magnitude of any ice load to which the pole might be subjected, the forces to which the break-away members are subjected vary from member to member and might subject some of the members to compression while others are in tension. The reduced cross sectional areas in the intermediate portions **32** of the break-away members are dimensioned so that stresses in the reduced cross sectional areas do not exceed the yield strength of the material of which the members are constructed when the members are subjected to maximum forces. It has become accepted practice in the industry to design such lamp poles for maximum wind of up to 100 miles per hour while the maximum permissible ice load is of course dependent on the geographic area at which the pole is installed.

The reduced cross sectional area of the elongated members serves as an intentional weakening point at which the mounting of lamp pole shall fail when subjected to dynamic loading from the impact of a moving vehicle when it strikes the pole. If the pole were rigidly mounted, severe damage to the vehicle and injuries to its occupants may result. If on the other hand, the pole gives, that is, breaks away under the impact, deceleration forces acting on the vehicle are reduced to a magnitude at which serious personal injuries or property damages are avoided.

Under dynamic loading, i.e. impact, maximum stresses in the member are cyclical and increase in magnitude with decreased ductility or increased brittleness of the material. Thus, for a given cross sectional area, materials of high brittleness, such as hardened steel, for example, can withstand a lesser dynamic load, or have a lesser impact strength, than materials having a low brittleness, such as an annealed steel. At the same time, the hardening of materials, particularly steel, increases their tensile and compressive strengths and enables them to withstand static, that is non-dynamic loads of a much greater magnitude than relatively soft steels.

The combination of these two effects is highly desirable in break-away members **26**. Their reduced cross sectional areas at portions **32** permits them to withstand the static loading from the weight of lamp pole **10**, as well as from wind and ice loads when they are constructed of a heat-treatable material such as steel and have been heat treated to increase their strength. The greater hardness of the members, however, reduces their impact strength and enables them to withstand lesser impact loads than if they had not been heat treated. Thus, the reduced cross sectional areas of the members can be dimensioned so that they withstand the static loads to which they are subjected while failing under the impact of a vehicle striking lamp post **10**.

To maintain the strength of the break-away members at their reduced cross sectional areas it is desirable to protect them at least at portions **32** against corrosion which might, in time, sufficiently weaken the member so that it fails under normally expected wind or ice loads. Consequently, if the members are constructed of carbon steel they are hot-dipped galvanized or plated with a suitable metal. Both plating and galvanizing have adverse effects on the physical properties of steel. The former causes uncertain changes in the shearability of the break-away members at their reduced cross sectional areas. The latter anneales them since it must be applied hot, thereby nullifying at least a part of the preceding heat treatment of the member. It is, therefore, presently preferred to construct the break-away members of a corrosion-resistant material such as stainless steel. Stainless steel does not corrode under commonly encountered atmospheric conditions, yet it can be heat treated to give the members the desired hardness. An alternative to using stainless steel without incurring the above referred to undesirable side effects is to coat the break-away members after they have been installed with rust preventative compound such as tar, paint, greases, etc. These compounds have no adverse effect on the physical property of the material of which the break-away member is constructed.

After the lamp pole has been mounted as described above, suitable enclosures, indicated in phantom lines in FIG. 1, may be provided to enhance the appearance of the base of the lamp post or to prevent unauthorized persons from tampering with electrical wiring **46** or the mounting of the pole. Such enclosures, however, are not necessary for the practice of this invention.

Although it is presently preferred to construct break-away member **26** with an undercut so that its threaded ends **30** and **34** have like diameter and threads as the projecting end of anchoring studs **20** to economize in the production of sleeve **28**, the break-away member can, of course, be constructed without such an undercut. In that case the break-away members are dimensioned so that they have cross sectional area over their full lengths

which are equal to that of portion **32** of the break-away member **26** shown in FIG. 3. Since the members are constructed of relatively expensive materials, i.e. heat treatable stainless steel, the weight savings result in substantially lower manufacturing costs for the break-away members.

Another distinct advantage of the present invention is that it permits rigidly mounted poles to be converted into break-away poles. Rigidly mounted poles are frequently constructed identical to the construction of lamp pole **10** and include the mounting flange **22**. The flange, however, is directly secured to the upwardly projecting threaded end of anchor studs **20**. To convert the pole into a break-away pole, the nuts (not shown) securing the flange and the pole to the anchoring studs are removed and the lamp pole is elevated a sufficient distance above foundation block **12** to permit the installation of the break-away members **26** with sleeves **28**. After the break-away members are installed and lower nuts **36** have been levelled with respect to each other, the lamp pole is lowered so that upper end **34** of the break-away members are disposed in the mounting holes of the flange. The lamp pole is then secured to the break-away members as described above. The raising of the pole to install the break-away base support therefor as above described may normally be done without requiring the disconnection of electric lines and the like which may be connected to the top of the pole.

It will now be apparent that the break-away base support of the present invention may be easily and readily applied at relatively low cost to a wide variety of poles and standards used along side of roadways for lighting, signaling, utilities and for warning and directional signs; and that such improved base support may be reinstalled with equal facility and low cost after being severed in the performance of its impact attenuation function.

We claim:

1. A breakaway base support for roadside poles subject to being struck by wayward automotive vehicles, said pole having a horizontal base mounting flange and a plurality of horizontally spaced vertical openings therethrough, a foundation, a plurality of elongated vertically set bolts mounted in said foundation and having externally threaded upper ends projecting vertically therefrom in substantially parallel relation, a plurality of elongated sleeve members having internally threaded ends one each

threadably mounted on one of said bolt ends and having internally threaded upper end portions extending vertically from said bolts, a plurality of elongated breakaway members having first externally threaded ends one each threadably mounted in an upper end portion of a sleeve and having second externally threaded ends extending vertically therefrom and being mounted through said flange openings, means on said second ends of said breakaway members and providing a level platform support for the underside of said flange, nuts threadably mounted on said second ends of said breakaway members and bearing on the upper side of said flange for clamping said flange between said means and nuts, said ends of said breakaway members and said bolts having a substantially equal cross-sectional area and a mid-portion of said breakaway members between said sleeves and means having a relatively reduced cross-sectional area, said breakaway member being composed of a material having lower ductility and higher ultimate strength than the material of said bolts and said mid-portion being dimensioned to provide compression and tensile strengths substantially equal to the compression and tensile strengths of said bolts and impact shear strength substantially less than said bolts.

2. A breakaway base support as defined in claim **1** wherein said breakaway members are formed of heat treatable stainless steel.

3. A breakaway base support as defined in claim **1**, said means comprising nuts threadably attached to said second ends and providing adjustable leveling of said platform support.

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85—61; 248—158