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[54] TAPER LOCK BREAK-AWAY POLE STRUCTURE

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[52] **U.S. Cl.** **52/296,** 52/98, 52/296, 52/726, 248/158, 248/346, 94/1.5

[51] **Int. Cl.** **E02d 27/42**

[58] **Field of Search**.....248/159, 361 B, 158, 361 R, 248/346; 287/DIG. 3, 20 R; 52/726, 296; 94/1.5; 285/3, 4

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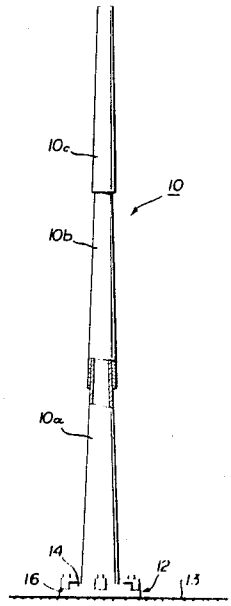
[57] **ABSTRACT**

A pole structure such as for signs or utility installations is composed of a plurality of tubular tapered sections locked one to each other in telescoping fashion; the lowest section of the pole structure has a flange which is releasably attached to an inground base support of the pole by means of pivot clamps and/or shear pins which are adapted to give way or break when the pole is hit by an object at a certain magnitude of impact force to thereby permit the pole to break-away from the base without destroying the pole; the several individual taper lock pole sections, when the pole breaks-away from the base, are permitted to separate, permitting substantially complete recovery of the pole structure after being forcibly yanked from its ground support by the impact force.

4 Claims, 11 Drawing Figures



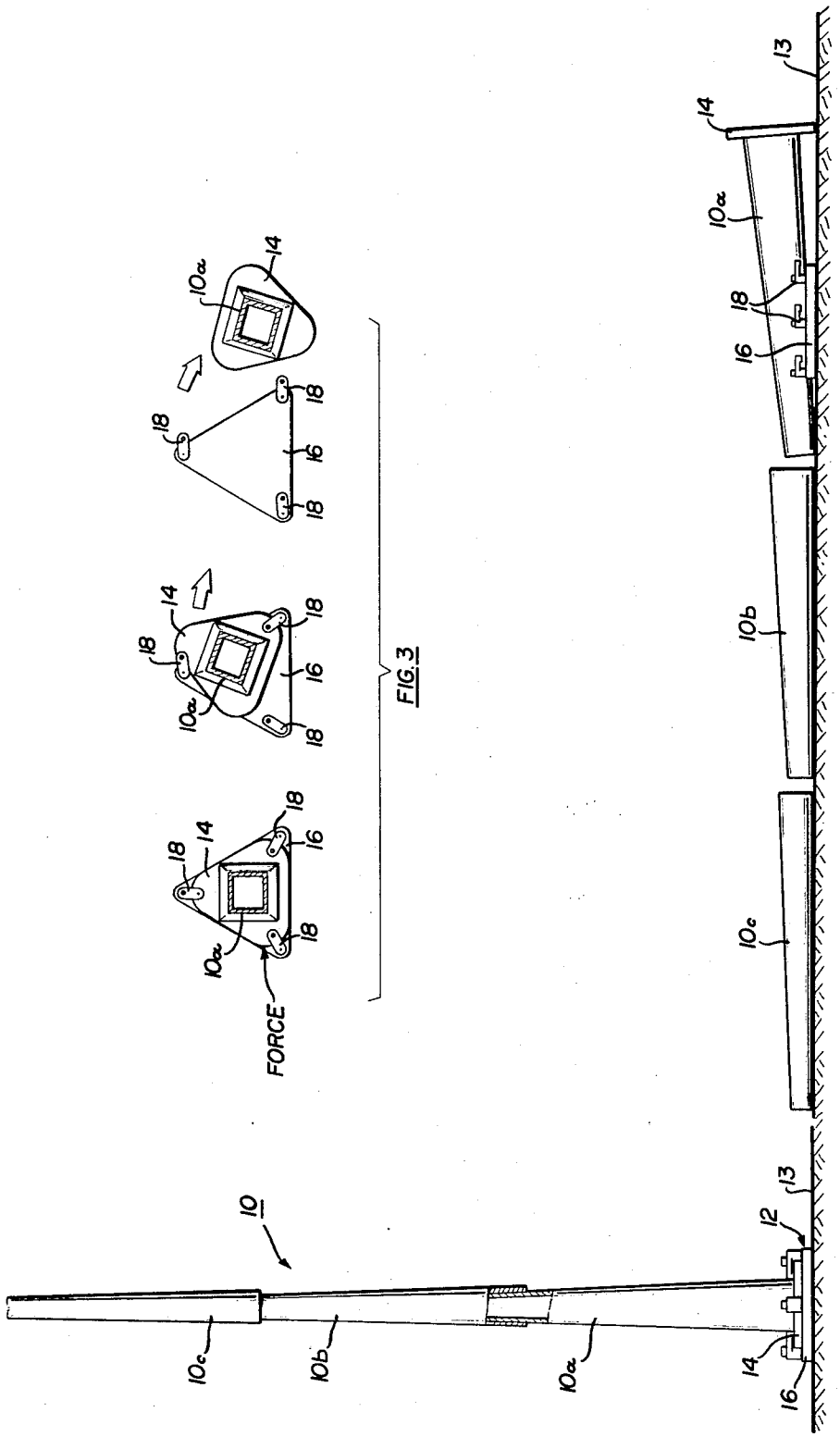


FIG. 1

FIG. 2

FIG. 3

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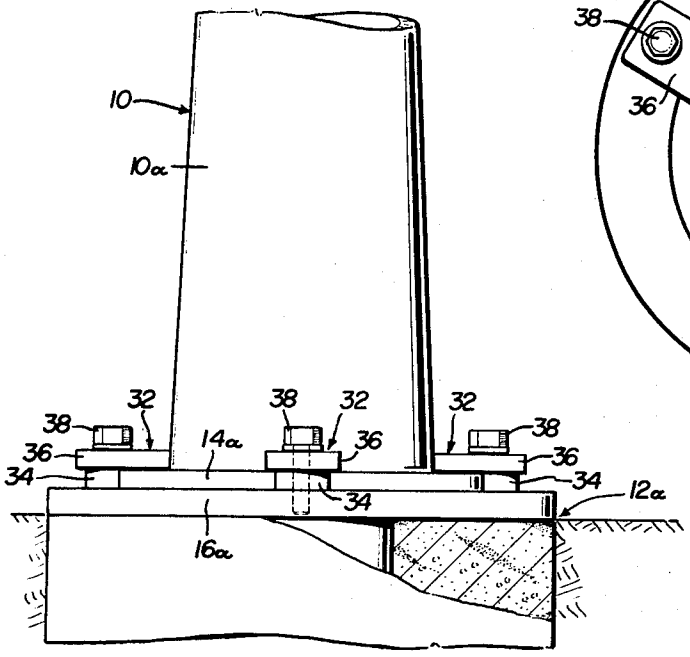
FIG. 5a



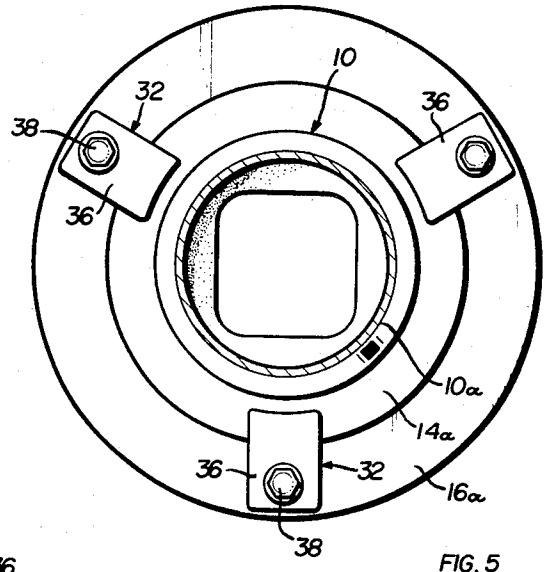


FIG. 5

FIG. 4a

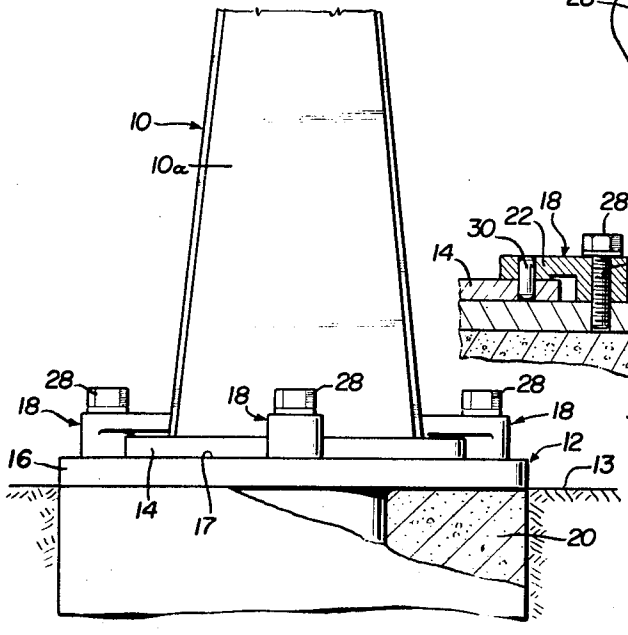


FIG. 4b

FIG. 4

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FIG. 6

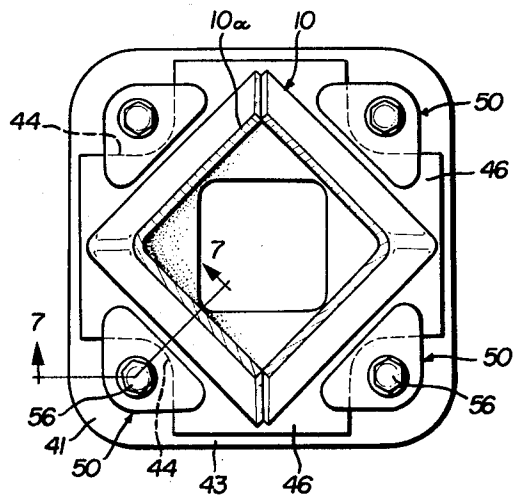
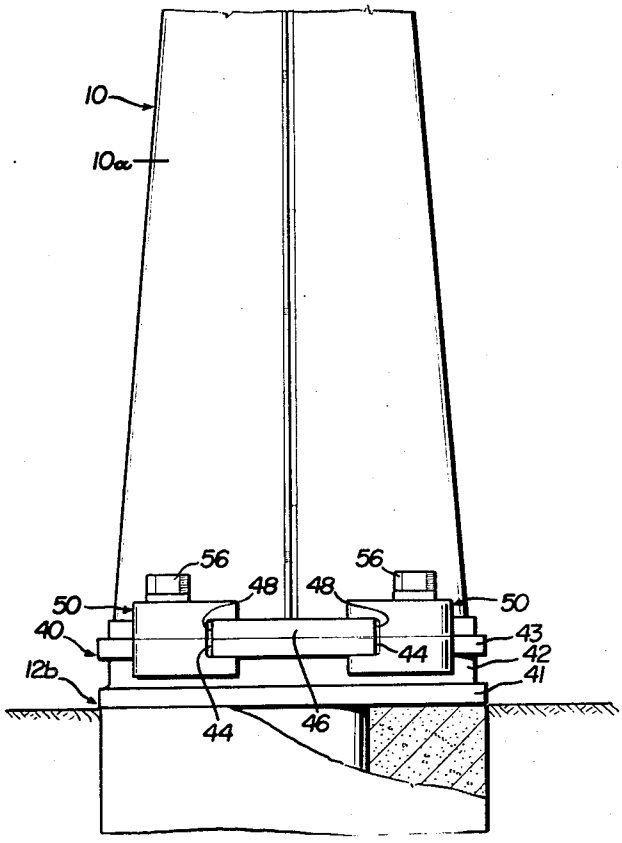


FIG. 6a



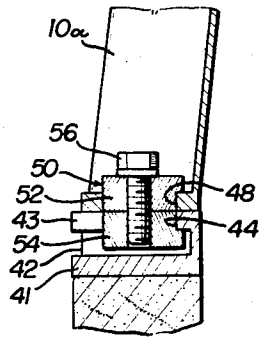


FIG. 7

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TAPER LOCK BREAK-AWAY POLE STRUCTURE

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention refers to pole structures such as are used in street lighting, sign supports, utilities, etc. and more in particular to a break-away pole structure which permits the pole to give at a certain impact force beyond a predetermined magnitude.

It is well known that poles used alongside curbs of road ways for support of signs, lights, electrical power cables, etc., are constantly subjected to being hit by an object moving along the road way, such as a vehicle. Conventionally, in most instances, the poles, or posts, are solidly anchored to the ground base support. Thus, when being hit by a moving object, such as a fast travelling vehicle, not only the vehicle but the pole or post as well, will be severely damaged; in many instances causing the pole to bend over adjacent the point of impact in spite of its otherwise rigid construction. It will be obvious that, in view of the normally immovable pole structure, when the pole is hit by a passenger occupied vehicle, not only material damage occurs to the vehicle and to the pole, but the passengers in the vehicle will be subject to severe injury or death.

It is well known that year after year, road side poles have to be replaced once they have been forcibly removed from their base, at great expense to the tax paying public.

Accordingly, it is the primary object of the present invention to provide a road way pole structure adapted to break away under an impact force, to thereby considerably reduce material damage and personal injury otherwise incurred.

It is a further object of the invention to provide a sectional pole structure composed of a plurality of tapered, frictionally retained tubular pole sections which, when the lower section thereof is being hit by a moving object, are adapted to separate from each other and to fall on the ground, thereby preventing complete destruction of the pole, the separate sections being fully recoverable and reusable.

The pole structure of the present invention is comprised of a plurality of tubular sections which may have any desired cross-sectional configuration, such as round, square, triangular, or the like and which are tapered in longitudinal direction. The individual pole sections are assembled in telescoping fashion and by means of the longitudinal taper configuration, the sections are retained in vertical position by frictional interlock, and by gravity due to their own weight.

The lower, primary pole section is provided with a supporting flange which is removably attached to the inground support base of the pole by means of pivotal clamps and/or shear pins. These are adapted to give way under an impact force above a certain magnitude to thereby release the pole assembly from the inground support base and permit the pole to fall to the ground. The individual frictionally interlocked pole sections are permitted to separate from each other, as the pole assembly falls to the ground.

The present invention will be best understood by reference to the following detailed description of several preferred embodiments thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate several preferred embodiments of the invention as described hereafter and in which:

FIG. **1** is an assembly illustration of a pole or post structure constructed in accordance with the present invention;

FIG. **2** is a composite illustration of the sectional pole of FIG. **1** being separated after forced from its support base;

FIG. **3** is another composite illustration showing the sequence of the pole flange separating from the base support under an impact force;

FIG. **4** is a cross-section on an enlarged scale of the base support of the pole assembly in FIG. **1** but utilizing a triangular tube section;

FIG. **4***a* is a fragmentary side view of the base support portion of the pole structure of FIG. **4**;

FIG. **4***b* is a cross-section through the shear pin arrangement utilized in the pole and base structure of FIG. **4**;

FIG. **5** illustrates another embodiment of a base support structure in accordance with the present invention utilizing a pole of cylindrical tube section;

FIG. **5***a* is a fragmentary vertical side view of the base support of FIG. **3**;

FIG. **6** is still another embodiment of a base support structure in accordance with the present invention utilizing a pole of square tube section with a pivoting clamp arrangement;

FIG. **6***a* is a fragmentary vertical side view of the base support structure shown in FIG. **6**; and

FIG. **7** is a cross-section through the base support structure shown in FIG. **6** along line **7**—**7** thereof.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

With references to FIG. **1** of the drawings, there is illustrated a pole assembly according to the invention indicated by the numeral **10** which is supported on an inground base support **12**. The pole assembly **10** may be utilized for lighting purposes of a road way, or for sign support, cable support, or the like.

According to the present invention, the pole assembly **10** is composed of a plurality of individual tapered pole sections **10***a,b,c,d*, etc., which are telescopically interlocked one to each other. Any desired number of pole sections may be assembled together to obtain the required pole height, as will be understood.

In general, the individual tubular pole sections, **10***a,b,c,d*, etc., of any cross-sectional configuration, diminish in cross-section towards the top so that the complete pole assembly **10** assumes a tapered configuration of diminishing cross-section in upward direction, to permit the pole assembly to slightly sway under wind influence without breaking.

The lower section **10***a* of the multiple pole assembly **10** is provided with a radial flange **14** which may have any desired planar configuration such as square, round, triangular or the like, and which is adapted to be flatly supported upon the top of a plate **16** which constitutes the top of an inground support base assembly **12** located above the ground surface **13**.

In the schematical illustrations in FIGS. 1 to 3, the top plate 16 of the inground support base assembly 12 is provided with a plurality of pivotal clamp assemblies 18 adapted, in assembly, to clamp the lower most pole flange 14 to the base support. The clamp assemblies, as will be more described and shown in detail hereinafter, may be pivotable clamp assemblies securing the pole flange 14 at a certain magnitude of clamping force sufficient to normally retain the fabricated pole assembly 10 in vertical upright position. However, the pivotal clamp assemblies 18 are adapted to give under a certain impact force against the pole assembly 10 to permit the pole assembly to separate from the inground base support assembly 12.

As is shown in the composite drawing in FIG. 3, in the figure at the left, the fabricated pole assembly 10 is shown in normal vertical upright retained position on the base support assembly 12, that is, the pole support flange 14 of the lower most pole section 10a is squarely supported upon the top support plate 16 of the inground base support assembly 12 and retained thereon by means of the clamp assemblies 18.

In the second figure of the composite drawing of FIG. 3, an impact force has been applied to the fabricated pole assembly 10 at a magnitude of force exceeding the clamping force of the pivotable clamp assemblies 18 and causing the pole assembly and the clamp assemblies 18 to be rotated in the directions shown, corresponding to the direction of applied force and thereby yanking the pole support flange 14 out of clamping engagement with the top plate 16 of the inground base support assembly 12.

The last figure in the composite drawing of FIG. 3 illustrates the complete separation of the pole support flange 14 on the lower most pole section 10a from the top plate 16 of the inground base support assembly 12; the clamp assemblies 18 having been forcibly pivoted out of the way to permit the separation.

With reference now to the composite drawing of FIG. 2, as the fabricated pole assembly 10 separates from the inground support base assembly 12, the several individual telescopically taper locked pole sections 10*a*,*b*,*c*, etc., due to the shock load of the impact force against the fabricated pole assembly and because of the displacement from their normal vertical, interlocked position, will be caused to separate from each other to individually fall to the ground 13. The ground impact is considerably less than the impact force otherwise incured if the pole were made in one piece and permitted to fall to the ground, which, in most any instance, would cause the pole to break. The individual pole sections, as they separate from each other and fall to the ground although they may be slightly indented when they hit the ground, are in most instances reuseable and can easily be salvaged and reused as will be appreciated.

However, the primary concern of the present invention is the improved safety factor involved with the present improved break-away base construction so as to considerably reduce material damage and personal injury when the pole is being hit by a moving object, such as a vehicle.

Although in FIG. 3 the fabricated pole assembly 10 is illustrated to be composed of tubular sections having a square cross-section it will be appreciated that any other cross-sectional shape may be employed such as cylindrical, triangular or other polygonal shapes as will be subsequently described hereafter.

FIGS. 4 to 7 illustrate various preferred embodiments of pivot clamp and/or shear pin assemblies adaptable for attachment of the fabricated pole assembly 10 to the inground base support assembly 12 and to permit separation therefrom under an impact force of a certain magnitude.

FIGS. 4 to 7 likewise indicate various cross-sectional configurations of the individual pole sections of the fabricated pole assembly 10 which, however, are only representative of the most common configurations conventionally used because of economy and ease of manufacture although, as mentioned before, any other polygonal cross-sectional shapes may be employed.

Now referring first to the embodiment illustrated in FIGS. 4 to 4*b*, the base support assembly 12 includes an inground base 20 which supports an above ground support plate 16 having a flat surface 17 adapted to flatly support the pole flange 14 provided on the lower most pole section 10*a*.

In the embodiment of FIGS. 4 to 4*b*, the inground base support plate 16 is shown to be of triangular configuration in plan view as seen in FIG. 4, although any such configuration is immaterial.

The inground base support plate 16 is provided with a plurality of clamp assemblies 18 circumferentially spaced therearound at radially equally spaced distances. The clamp assemblies 18 are identical and each comprises a clamp arm 22 integrally extending from an enlarged boss portion 24 (FIG. 4*b*) which abuts upon the surface 17 of the inground support base plate 16. The boss portion 24 of the clamp assembly 18 is apertured as at 26 to receive a fastener such as a bolt 28 for threaded attachment of the clamp arm 22 to the inground base support plate 16 by means of tightening of the bolt 28. In assembly, the outer end of the clamp arm 22 abuts upon the upper surface of the pole flange 14 such that when the bolt 28 is tightened into the inground base support flange 16 the pole flange 14 will be tightly clamped down upon the upper surface 17 of the inground base support plate 16.

Since a plurality of clamp assemblies 18 are provided which are radially equally spaced around the pole assembly 10, the pole assembly 10, when the clamp assemblies 18 are tightened, will be maintained in correct vertical aligned position relative to the inground base support plate 16.

As shown more in detail in FIG. 4*b*, the arm extension 22 of each of the clamp assemblies 18 is provided with a shear pin 30 which extends into an appropriate aperture provided in the radial flange 14 of the lower pole section 10*a*. Thus, when the clamp assemblies 18 are tightened down by means of the bolts 28 the radial flange 14 of the lower pole section 10*a* will be normally non-rotatably retained in fixed position on the base support plate 16. The shear pins 30 have a predesigned shear strength to permit them to break under the influence of an impact force against the lower pole section 10*a* of a predetermined magnitude.

Thus, it will be seen, as graphically illustrated in FIG. 3, that at the instant of an impact force of predetermined magnitude against the lower pole section 10*a*, the shear pins 30 of the clamp assemblies 18 will break,

causing the entire pole assembly **10** to be rotated from its position on the base support plate **16** and out of engagement with the clamp assemblies **18**, which are likewise pivoted out of the way due to the impact force as the pole moves off the base support plate **16** and subsequently falls to the ground, as illustrated in FIG. **2**, permitting the individual telescopically taper locked pole sections, **10***a*,*b*,*c*, etc., to separate from each other, thereby considerably reducing break damage to the pole, which most likely would be incured if the pole were made in one piece.

Except for the breaking of the shear pins **30**, there will be substantially no damage to the inground base support assembly **12** nor to the clamp assemblies **18**, permitting the reerection of the pole assembly in a minimum amount of time and labor, the shear pins being easily replacable at a minimum amount of cost.

Although the tapered pole section **10**a in FIG. **4** is shown to be of tubular triangular cross-section, as mentioned before, the tubular cross-section of the pole assembly is immaterial. Thus the section could be square as shown in FIG. **3** and **6**, or cylindrical as shown in FIG. **5**. Similarly, the end flange **14** of the lower most pole section as well as the base support plate **16** can have any desired planar configuration which may be best suited for any particular installation.

However, in the installation of relatively high poles such as used in highway installations, to which the shear pin and clamp arrangement of FIGS. **4** to **4**b is particularly applicable, a triangular base and pole flange structure, as shown, will be preferred since, as much as the pole could be contacted from any angle by an impact force, the shear pin and clamp assembly would shear, permitting the flange of the lower most pole section to swivel off the base support plate as shown in FIG. **3**.

With reference now to FIG. **5**, this design of a breakaway pole and base support assembly in accordance with the present invention is particularly applicable for poles of lesser height and for poles in locations where the poles are not likely or liable to be hit by fast moving vehicles at a great impact force, such as poles used in parking lots and the like. In these instances, the poles may be subjected to impact by relatively slow moving vehicles or vehicles moving at a normal speed thus, the break-away base assembly of the embodiment in FIG. **5** and **5***a* is designed such as to give way under a lesser impact force than that required for the break-away base assembly of FIGS. **4** to **4***b*.

The embodiment in FIGS. **5** and **5***a* utilize a round base support plate **16***a* and a similarly round radial pole flange **14***a* which, in assembly, is adapted to be placed concentrically on the base support plate **16***a*. Although in FIG. **5** the pole section **10***a* is likewise shown to be of tubular cylindrical cross-section, the pole section itself could be of any other cross-sectional configuration such as square or triangular.

The round radial flange **14**a of the lower most pole section **10***a*, in assembly, is clamped onto the base support plate **16***a* by means of a plurality of pivotable clamp assemblies **32** which comprise each a boss portion **34** for abutment upon the surface of the base support plate **16***a*. A clamp arm portion **36** extends from each of the boss portions **34** of the clamp assemblies **32** adapted for clamping extension over the rim of the radial flange **14***a* of the lower most pole section **10***a*. In assembly, the clamp assembly **32** is secured in place by means of bolts **38** extending through the boss portion **34** and threaded into the base support plate **16***a*. The clamp assemblies **32** in FIG. **5** are designed to have a predetermined clamping force of such magnitude as to normally maintain the pole assembly **10** in upright vertical position on the base support plate **16***a*. However, if the lower most pole section **10***a* is contacted by an impact force of a predetermined magnitude exceeding the clamping force provided by the clamp assemblies **32**, the clamp assemblies **32** will be pivoted out of the way permitting the radial flange **14***a* of the lower most pole section **10***a* to swivel off the base support plate **16***a* to permit the pole assembly **10** to fall to the ground and separate. The base support assembly **12***a* remains substantially intact for quick and easy reassembly of a new or the same pole assembly.

With reference now to FIG. **6**, **6***a* and **7**, this embodiment illustrates a further modification of a break-away base support assembly and in this instance utilizes a tubular pole structure of square cross-section, although, in this embodiment likewise, the particular cross-sectional configuration of the pole assembly **10** is of no importance, the various configurations being shown only for illustrative purposes. However the planar configurations of the radial flange on the lower most pole section and the base support plate itself are of some particular importance in certain embodiments as herebefore explained in connection with the description of the embodiments of FIGS. **4** and **5**.

In the embodiment of FIGS. **6**, **6***a* and **7** an entirely different break-away base support assembly is being utilized as described hereafter.

The above ground base support plate **40**, in this instance, is a plate of relatively thick cross-section to accommodate the provision of a central circumferential groove **42** therearound, so as to provide a lower plate section **41** and an upper plate section **43**.

With reference to the planar cross-section in FIG. **6**, the upper plate section **43** of the base support plate **40** is cut out at a plurality of circumferentially equally spaced locations, such as at **44**, and located substantially within the plane of the circumferential groove **42**.

The radial flange **46** at the bottom of the lower most pole section **10**a, in this instance, is of substantially rectangular configuration in plan view and is provided with a similar plurality of cut outs **48** substantially matching the cut outs **44** in the base plate **40**.

A plurality of split clamp assemblies **50** are disposed within the locations of the spaced co-extensive cut outs **44**–**48** on the base support plate **40** and radial flange **46** of the lower most pole section. The split clamp assemblies **50** are of substantially triangular configuration, in plan view, comprising a lower clamp member **54** and a substantially identical, super-imposed upper clamp member **52**. The opposite corner portions along the long side of the triangular shaped split clamp assemblies **50**, in assembly, extend across and overlap the edges of the cut outs **44**–**48** such, that the inside of the lower clamp member **54** extends within the groove **42** of the support base plate **40** and abuts against the underside of the upper plate section **43** and, similarly the inner side of the upper clamp member **52** extends across and abuts against the upper surface of the flange **46** on the lower most pole section.

The pole assembly **10** is normally retained in vertical upright position by means of clamping the upper and lower split clamp members **52–54** together by means of bolts **56** threaded through both clamp members, such that, upon tightening of the bolt members which are located at the apex of the triangular shaped clamp assemblies within the cut outs **44–48**, opposite clamping pressure will be exerted against the underside of the top plate section **43** and against the top surface of the pole flange **46** for clamping securement of the pole section to the base support plate **40**.

It shall be mentioned here that, although a square arrangement and 90° spacing of the clamping members is shown in FIG. **6**, any other arrangement could be utilized and the number of clamping members could be reduced or increased as suitable, largely depending on the cross-sectional configuration of the pole assembly being utilized.

This embodiment of break-away base support assembly is likewise primarily adaptable for relatively low pole structures and poles which are in locations in which they are not normally suspected to be subjected to high impact forces, such as parking lot locations and the like.

The clamp assemblies **50** in this instance, when the respective pole assembly is subjected to an impact force of a certain magnitude, is caused to slide from the ground support base plate **40** to permit the lower most pole section to swivel off the base support plate. The split clamp assemblies **50**, in the embodiment of FIGS. **6** to **7**, retain the pole assembly **10** only by means of the frictional clamping force, which is determined by the torque with which the bolts **56** are tightened and which in turn is dependent on the diameter and shape of the bolt threads. Thus, the split clamp assemblies **50**, after having been forcibly removed by an impact force against the lower most pole section **10*a***, will remain intact and can be reused again for quick reassembly of the pole structure.

Thus, the present invention illustrates and discloses basically two variations of a break-away base support assembly which, in the embodiment of FIGS. **4** to **4*b***, employs a shear pin and pivot bracket assembly, primarily adaptable for high pole installations such as are used along highways and which require wind resistance and greater shear strength from the impact of fast moving vehicles.

The embodiments of FIGS. **5**,**5*a*** and **6**,**6*a*** and **7** are primarily adaptable for lower pole structures and pole structures disposed in locations in which they are not liable to be subjected to high impact forces by fast moving vehicles or the like. Accordingly, the pole assembly **10** in FIG. **5** is secured to the base support assembly by means of a plurality of pivotable clamps, which are permitted to be pivoted out of the way when the pole assembly is hit by an impact force of a certain magnitude. Similarly, the embodiment of FIGS. **6**,**6*a*** and **7** require only a plurality of split clamp assemblies for attachment of the pole assembly **10** to the base support assembly. In this instance, the complete clamp assembly is moved out of the way, that is, off from its clamping engagement with the top plate of the support base assembly, when the pole assembly is being hit by an impact force.

Regardless of the break-away base support structure in either FIGS. **4**,**5** or **6**, the pole assembly **10**, as already described herebefore, is constructed of a plurality of tubular, outwardly tapering, individual pole sections, telescopically and frictionally retained one on top of each other to any desired height (in certain installations as high as 72 feet). The sectional tapered, tubular pole structure considerably facilitates transport and storage of poles of various heights by inserting different pole sections of varying diameters one within the other. Thus, a variety of poles of varying diameters and of varying assembly heights can be conveniently stored and transported, requiring considerably less space than one piece poles or preassembled poles.

The present invention may be embodied in certain other forms without departing from the spirit and essential characteristic thereof, therefore, the present embodiments are to be considered in all respects as illustrative only and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description.

I claim:

1. A pole and associated support base assembly comprising:

a base member set within the ground having a portion extending above the ground surface;

said above ground portion comprising a plate member;

a fabricated pole assembly, the pole assembly being provided with a radial flange at the lower end thereof;

said radial flange being adapted to be supported in flat abutting relationship on top of said plate member;

and releasable means normally rigidly securing said radial flange to said plate member to maintain said fabricated pole in vertical upright position on said base support;

there being a series of spaced vertically aligned outwardly opening radial indentations in said plate member and radial flange;

said means releasably securing said radial flange to said plate member comprising a plurality of split clamp assemblies circumferentially spaced therearound;

each clamp assembly including superimposed upper and lower clamp members located within said indentations, with their free respective ends overlapping and retainingly engaging the corresponding adjacent top and bottom surfaces of said radial flange and plate member;

a fastener extending through each pair of clamp members for securing said clamp members to each other and said flange and plate member;

said clamp assemblies when subjected to an impact force of a certain magnitude being adapted to slide from the plate member permitting the pole assembly to swivel off the base support plate.

2. In the pole and support assembly of claim **1**, said pole assembly composed of a plurality of individual tubular sections; each of said tubular sections being tapered in an upwardly converging relationship with the next tubular section for assembly of said plurality of said tubular sections in telescoping fashion one on top of each other; said plurality of tapered tubular sections being retained in assembled vertical position by means of a frictional interlock between said telescopically assembled tapered sections.

3. In the pole and support assembly of claim 1, said upper and lower clamp assemblies being of substantial triangular configuration.

4. In the pole and support assembly of claim 1, the opposed inner edges of said upper and lower clamp assemblies being respectively undercut defining plate member and radial flange engaging members.

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