Jan. 27, 1959 C. E. TIPSORD ET AL 2,871,282

HOT LINE GUARDS

Filed June 17, 1957 2 Sheets-Sheet 1

Fig. 1.

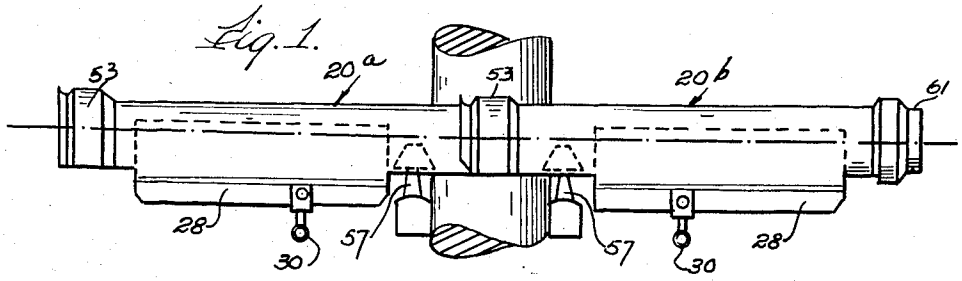


Fig 2.

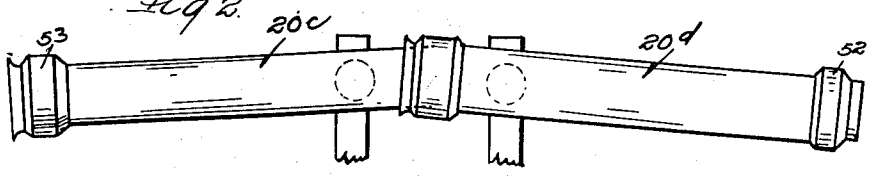


Fig 3.

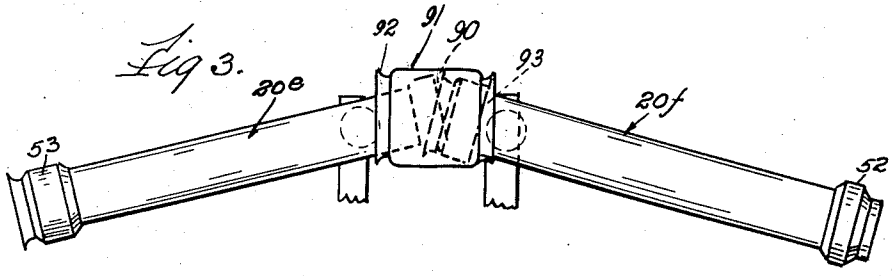
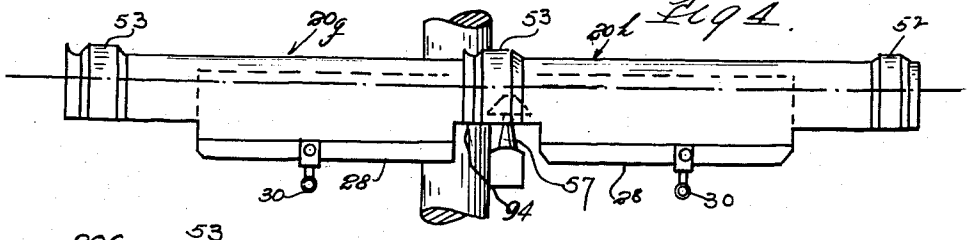


Fig 4.



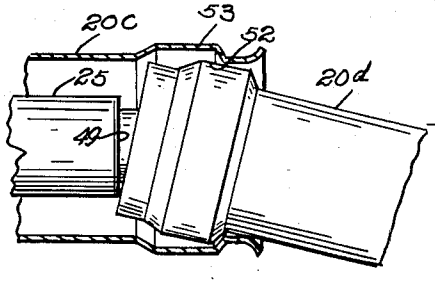


Fig. 11.

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Jan. 27, 1959 C. E. TIPSORD ET AL 2,871,282

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Filed June 17, 1957 2 Sheets-Sheet 2

Fig 5

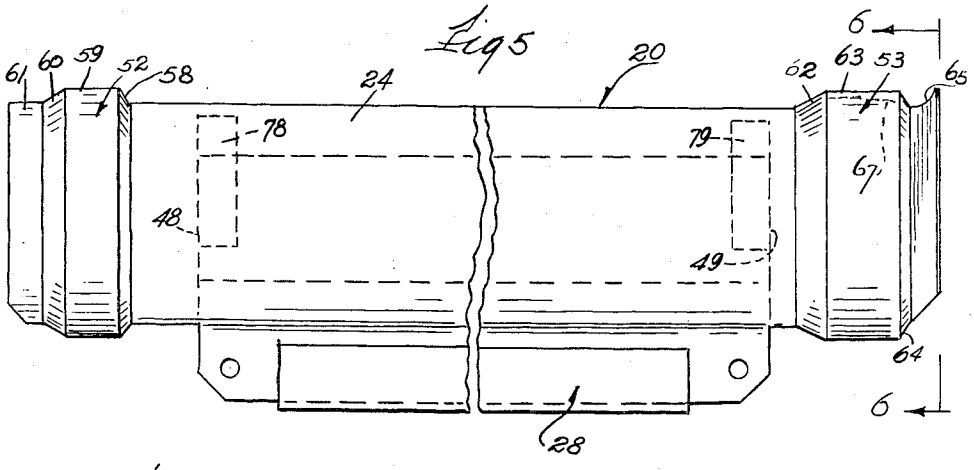


Fig. 6.

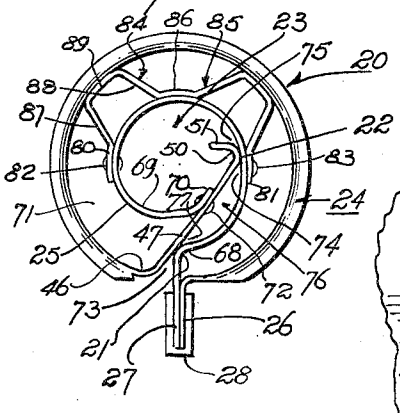


Fig. 7.

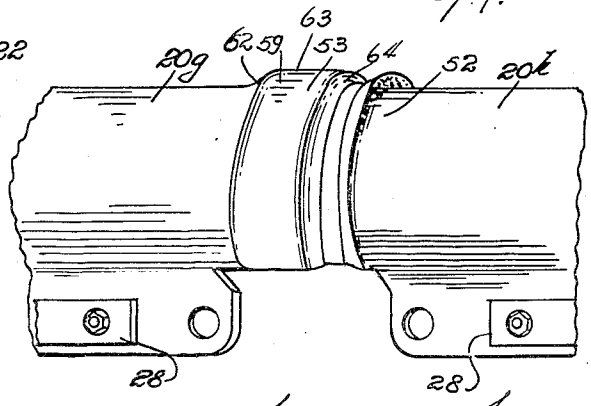


Fig. 8.

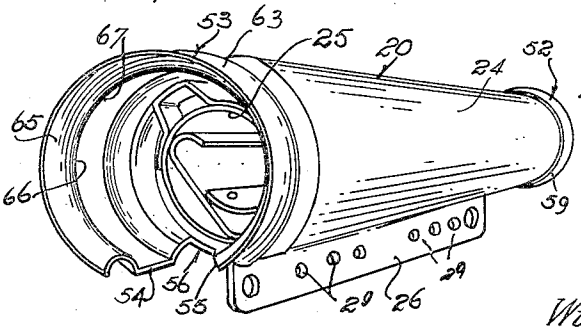


Fig. 9.

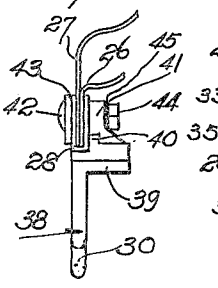
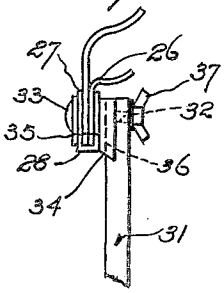


Fig. 10.



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HOT LINE GUARDS

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Application June 17, 1957, Serial No. 666,166

14 Claims. (Cl. 174—5)

The present invention relates to hot line guards, and is particularly concerned with line guards of the type which may be manipulated by means of an insulating pole, and placed over a high voltage electric transmission line adjacent the cross arm and insulators, for covering and insulating the line in such manner that linemen are protected from shock, by contact or proximity to the high voltage line.

One of the objects of the invention is the provision of an improved line guard which is adapted to be applied to the conductor safely with a movement in a single direction.

Another object of the invention is the provision of an improved line guard which is provided with a double wall having an air gap between the walls, providing air gap insulation protection completely around the conductor.

Another object of the invention is the provision of an improved line guard of such structure that only one type of unit is required for covering the conductors and insulators completely across one or more cross arms and insulators, arranged in alignment or at various angles without necessity for providing an additional intermediate hood or insulator cover.

Another object of the invention is the provision of improved line guard units which may be locked together at various angles in covering the line and insulators, and which are simple in construction, sturdy, capable of economical manufacture, and of universal application to various types of line installations.

Another object of the invention is the improved line guard having extensions at its ends which are adapted to telescope and be joined mechanically and universally with a similar guard, similarly installed from the opposite direction to effect a complete insulation cover of the line and insulators on both sides of the pole.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings of which there are two sheets accompanying the specification,

Fig. 1 is a fragmentary, elevational view of a line pole and double cross arm installation provided with two line guard units of the type embodying the invention, showing the installation when the pole carries two cross arms and insulators in alignment with each other;

Fig. 2 is a similar fragmentary plan view showing the installation of a pair of guards on a line having two cross arms and insulators, where the line extends from the insulators at a small angle;

Fig. 3 is a view similar to Fig. 2, showing an installation embodying two of the line guard units where the angularity of the conductors extending from the two insulators exceeds that of Fig. 2 and permits the complete coverage of the line with two of the present units, only with the use of an intermediate cover;

Fig. 4 is a fragmentary, elevational view similar to Fig. 1, showing the installation of the line guard units over a cross arm carrying a single insulator;

Fig. 5 is a side elevational view of a line guard unit embodying the invention;

Fig. 6 is an end elevational view taken on the plane of the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary view in perspective showing two of the line guard units with their male and female formations joined as shown in Figs. 1 and 4;

Fig. 8 is a view in perspective of the line guard unit, showing the female end and the internal structure thereof;

Fig. 9 is a fragmentary end elevational view of the supporting structure for the lower edge of the line guard when it is to be manipulated by a hot line pole, adapted to grasp a standard eye of the type used on tools and tap clamps;

Fig. 10 is a view similar to Fig. 9, showing the mode of attachment of the guard of Figs. 5 to 8 to an insulating pole or hot stick not having the eye of Fig. 9;

Fig. 11 is a fragmentary sectional view taken on a plane passing through the axis of the guard, showing the joint between the parts of Fig. 2.

Referring to Figs. 5 to 8, the present line guard unit is preferably constructed of high impact sheet plastic of a type which is substantially rigid, but sufficiently resilient to permit the parts of the unit **20** to be separated or to spring apart at the points of contact **21** and **22**, Fig. 6, through which the line conductor must enter to reach the central insulated space **23**.

The guard unit preferably includes an outer housing member **24** and an inner housing member **25**, which may be made out of two separate pieces of sheet plastic, each housing unit having a radially extending attaching flange **26** and **27**.

The attaching flanges **26** and **27** are arranged to engage each other and may be secured together by a substantially U-shaped channeled member **28**, which overlaps and encloses both of the attaching flanges **26** and **27**, and secures them together by means of a suitable cement, by integrally welding them together, or by fusing the parts together.

The attaching flanges **26**, **27** and the U-shaped securing member **27** may all be provided with a plurality of through apertures **29**, for securement of the guard unit to any of the supporting devices shown in Figs. 9 and 10.

One or more supporting rings or poles may be employed upon each guard unit, depending upon the length of the unit and the type of installation with which it is to be used.

When a single ring or pole is used to support such a guard unit, the single ring or pole is attached to the guard unit at a suitable point intermediate its ends, as illustrated by the rings **30**, **30**, attached to the guard units of Figs. 1 and 4.

The guard units are adapted to be manipulated by means of a long insulating pole **31**, directly attached to the bottom of the unit shown in Fig. 6, after the manner of Fig. 10, or they may be manipulated by means of a

clamp stick which is attachable and detachable to the ring 30, shown at the bottom of Fig. 9.

When an insulating pole 31 is directly attached as shown in Fig. 10, the round, wooden pole of dried lumber is coated with an insulating varnish and provided at its upper end with a through bore 32, for passing the screw bolt 33, which also passes through the attaching flanges 26 and 27 and the U-shaped clamping member 28.

A metal shoe 34, having a through bore 32 is provided with a flat side 35, for engaging the U-shaped clamping member 28, and with a cylindrical groove 36, for receiving the pole 31.

A thumb nut 37, on the end of the carriage bolt 33 clamps all of the parts together and rigidly mounts the guard unit 20 on the pole 31, but permits an angular adjustment between the guard and pole.

When the guard is to be provided with a ring 30, as shown in Fig. 9, an angular ring casting 38 is provided, having the ring formation at its lower end, forming an eye similar to that used on tap clamps to be engaged by a clamp stick.

The casting 38 has an angular flange 39 at its upper end which is formed with an upwardly projecting rectangular rib 40, for engagement with a clamping member 41, having a through bore for the carriage bolt 42.

The bolt 42 passes through a washer 43 and through registering apertures in the U-shaped member 28, and the two attaching flanges 26, 27, and a registering aperture in the clamping member 41, to which it is clamped by a nut 44 and a split lock washer 45.

In this case the ring casting 38 is permanently attached to the guard unit which may be manipulated and mounted on any suitable insulating clamp stick.

The outer housing 24 of the guard unit 20 is carried by the attaching flange 26, and has a partially cylindrical formation extending from the attaching flange 26 to the point 46, where the outer housing is bent inwardly, being provided with the diagonal flange 47 for engaging the conductor and guiding it into the inner space 23.

The diagonal flange 47 is shorter than the overall length of the line guard, and the ends of the diagonal flange 47 are indicated at 48 and 49 in Fig. 5, showing that this diagonal flange is of similar length to the other internal structure or inner housing 25.

The diagonal flange 47 has an easy bend at 50 at its upper edge, and has an inwardly extending camming portion 51 to be engaged by the conductor in camming the parts of the guard apart when the guard is removed from the line.

The outer housing 24 is formed with a male portion 52 at one end and with a female portion 53 at the other end. Both the male and female portions 52 and 53 extend over less than 360 degrees so that they terminate at the walls of the slots 54 and 55 in each end, the slots 56 being of sufficient width to receive and pass about the insulator pins 57, Fig. 1, Fig. 4.

The male end of each guard unit is formed with the male formation 52 by forming that end of the guard unit with an outwardly extending, tapered wall portion 58, an enlarged cylindrical wall portion 59, and a second inwardly extending, tapered wall portion 60, joined to a partially cylindrical end portion 61 of the same size as the main portion of the outer housing 24.

This provides the male end of the guard with an enlarged annular formation 58, 59, 60, except for the slot 56, so that the male end of the guard may be received in the female end 53 of a similar guard.

The female end of the guard unit 20 is shown at the right of Fig. 5 and at the left of Fig. 8. The cylindrical body of the outer housing 24 at the female end is formed with a tapered, outwardly extending wall portion 62, an enlarged cylindrical wall portion 63, an inwardly extending, tapered wall portion 64, and an outwardly curved, partially bell-shaped end portion 65, except for the slot 56 at the bottom of this end of the guard.

The size of the inside of the bell-shaped portion 65 at the smallest diameter, indicated at 66 in Fig. 8, is large enough to pass the enlarged annular portion 59 of the male end of a similar guard.

The inside formation at the female end of the guard, Fig. 5, includes an annular groove 67, of sufficient width and diameter to receive the annular ridge 59 at the male end of a female guard.

Referring to Fig. 11, this is a fragmentary sectional view showing the male member inside the female member when the guards are at a small angle, as shown in Fig. 2. In this view the guard 20*c* is shown with its female end housing the male end of the guard 20*d*. The internal housing member 25 terminates at 49, leaving room in the female end portion 53 for the male end portion 52.

The plastic of which the tubes are made has sufficient resiliency so that it may give to permit insertion of the male portion 52, the outer tube expanding and the inner tube contracting during insertion, and springing back to give a mechanical lock, in which friction also helps to hold the parts together. Having the lower slot 56 also aids in this spring action of the parts in joining them together; and the tapered formations on the parts 52 and 53 also aid in camming the outer or female member 53 open to permit insertion or removal of the part 52.

The weight of the two guards, when installed as shown in Fig. 1, causes the female end to drop about the male end portion of a similar guard at the ridge 59, holding these two guards together in the position shown in Figs. 1, 2 or 3.

Thus the installation at any pole may consist of two similar guard units with a male end and a female end joined at the pole, eliminating the necessity for a cover at the joint and reducing the cost of the assembly.

Each guard unit is preferably provided with an elongated male portion at one end, and an elongated female portion may be provided at the end of a similar guard. This is for the purpose of making the slots 56 long enough to extend over two cross arms and two insulator pins 57, while effecting a covered joint, as shown in Fig. 1.

Guards may be provided with a shortened female portion 53 at the other end and with a shortened male portion 52 at the end of a similar guard so that when the guards are reversed to effect a joint over a single cross arm and to receive a single insulator pin 57, as shown in Fig. 4, there will be a minimum amount of opening below the joined male and female parts, as shown in Fig. 4.

The inner housing 25 has a wider attaching flange 27, extending to the point 68, where the attaching flange supports the partially cylindrical inner housing 25, extending upwardly and curving in the manner of a cylinder until the point or line 69, where the curvature extends at a lesser radius to bring the end attaching flange 70 of the inner housing into engagement with the diagonal flange 47 of the outer housing.

The attaching flange 70 is riveted to the diagonal flange 47 of the outer housing, securing these parts permanently together to provide an air space 71 of definite radial width.

A plurality of rivets 72 are employed. The diagonal flange 47 of the outer housing separably engages the inner housing at the point 21, toward which it is resiliently biased to automatically close the tapered opening 73 in the bottom of the guard.

Another tapered slot 74 is provided where the bent end 22 of the diagonal flange 47 engages the inside of the inner housing 25, so that the conductor entering the guard must cam its way into and through the tapered openings 73 and 74 to reach the inner space 23.

A third tapered slot 75 is provided inside the space 23 by the inwardly turned flange 51, which permits the conductor to cam open the flange 47 and inner housing 25 at the contacting point 22, when the conductor is to emerge from the guard into the safety space 76.

A fourth tapered slot 77 is provided on the upper

side of the bend or contact point **21**, so that the conductor emerging from the guard may cam the flange **47** away from the inner housing **25**, at the point **21**, as the conductor emerges from the guard.

The inner housing **25** is preferably definitely spaced from the inside of the outer housing **24** by a pair of spacing brackets **78**, **79**, Fig. 5, one of which is located at each end of the inner housing. These spacing brackets may comprise strips of a similar plastic insulation of sheet form, each strip being provided with a curved attaching flange **80**, **81** at each end, secured by rivets **82**, **83** to the inner housing.

Between the attaching flanges **80**, **81** of the spacing brackets **78**, **79** there are two U-shaped formations **84** and **85** joined by a curved portion **86** that engages the inner housing **25**.

The U-shaped portion **84** is in the shape of a tapered channel, having a pair of spreading legs **87**, **88** joined by a curved yoke **89** that engages the inside of the outer housing **24**. The other U-shaped formation **85** is of similar shape, engaging the inside of the outer housing **24**.

Thus the brackets **78**, **79** definitely space the inner housing **25** from the outer housing **24** at the top; and the same spacing is maintained by the structure previously described at the bottom of the guard so that there is a double wall structure with the walls widely spaced and separated by an air gap on all sides of the central space **23**, where the line conductor is finally received.

The length of the guard units may vary, as is indicated by the broken lines in the middle of Fig. 5; but the length is preferably such that the guards are elongated and sufficient in length to protect the lineman from engagement with the line or proximity to the line, and covering sufficient of the line so that the lineman is safe.

The various forms of installations of the guards are shown in Figs. 1 to 4. In Fig. 1 the guards have their elongated male and female portions arranged to be joined together over two cross arms and two insulators, showing that only two similar guards need be employed for this purpose.

In Fig. 2, this is a similar installation, illustrating the fact that the guards may be applied on line portions which extend at small angles to each other.

In Fig. 3 two line portions extend at a larger angle in such manner that there may be an opening between the male and female portions at **90**; but this is enclosed by means of a cover member **91**, which is of sufficient size inside to receive both the male and female end portions at such an angle, and which is provided with a female formation **92**, **93** at each of its ends.

In Fig. 4, an installation is shown in which the line is supported by a single insulator, and the short male and female extensions are brought together over the insulator, thus providing a bottom opening **94** of minimum length.

The operation of the present line guards is as follows:

The line guards are lifted into proper position by means of clamp sticks or elongated poles, attached as shown in Fig. 9 or Fig. 10, with the male and female ends pointing toward each other.

The pole is used to cause the line to engage the lower side of the guard at the tapered, elongated slot **73**, where a down pull on the guard causes the parts to separate at the point **21**, admitting the line to the space **75**.

The pull continues into the tapered groove **74**, separating the parts at the point **22**, and admitting the conductor into the central space **23**. Here the conductor is surrounded by two spaced walls of rigid insulators which are insulated from each other by the wide air gap over substantially 360 degrees.

The guard cannot be separated from the line without purposefully causing the line to enter the tapered groove **75**; and to effect a separation it is necessary to continue the upward push until the line passes down through the inner safety space **76** and out past the line of contact at **21**.

Thus the guards all have a double safety factor of two securing points for keeping the guard on the line. When the guards have been placed on the line, they are slid longitudinally on the line until the male and female parts come into engagement with each other, as shown in Figs. 1 to 4.

In exceptional cases, where there is a wide angle between the two line portions, a separate cover **91** may also be employed; but in most cases the cover need not be used.

It will thus be observed that we have invention an improved line guard unit which is simple in construction, capable of economical manufacture, and adapted to insulate the line with a minimum number of parts and with maximum safety and maximum insulation.

The present guard units are automatically attached to the conductor with a single direct downward movement. They may be readily detached by a positive upward movement, causing the line to pass two points of resistance, which give the guard a safety factor against accidental separation.

In some embodiments of the invention the insulating spacing brackets **78** and **79** may be replaced with a layer of rigid or semi-rigid insulating foam between the inner housing and the outer housing, thus assuring an insulating spacing of predetermined proportion on all sides of the line contained in the inner housing.

While we have illustrated a preferred embodiment of our invention, many modifications may be made without departing from the spirit of the invention, and we do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of all changes within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States, is:

1. In a line guard the combination of an insulating support with a stiff, resilient, elongated insulating member of sheet material, forming an inner and an outer housing about an electric line conductor, said housings comprising a pair of separate generally round and concentric tubular members each being open at its lower side and forming a double wall of insulation with the walls spaced from each other to form an insulating air gap surrounding said conductor, said support comprising an attaching flange depending from the open side of each housing to permit application of the guard to the line conductor by a downward pull, said outer housing having an upwardly projecting wall portion resiliently engaging the inside of the inner housing at the open side forming a tapered slot to be cammed open by the conductor and to snap shut upon the passage of a conductor into the guard.

2. In a line guard the combination of an insulating support with a stiff, resilient, elongated insulating member of sheet material, forming an inner and an outer housing about an electric line conductor, said housings comprising a pair of separate generally round and concentric tubular members each being open at its lower side and forming a double wall of insulation with the walls spaced from each other to form an insulating air gap surrounding said conductor, said support comprising an attaching flange depending from the open side of each housing to permit application of the guard to the line conductor by a downward pull, said outer housing having an upwardly projecting wall portion resiliently engaging the inside of the inner housing at the open side forming a tapered slot to be cammed open by the conductor and to snap shut upon the passage of a conductor into the guard, said inwardly projecting wall portion having a pair of spaced points of engagement with the inner housing to provide a double factor of safety against the guard getting off the conductor.

3. A hot line guard, comprising an elongated member

of rigid but resilient electrically insulating plastic material, said guard having an outer housing member open at its ends and an inner housing member open at its ends, said housing members being spaced from each other to provide a double insulating wall, and an air gap between them for insulating a conductor located in the inner housing, to protect a lineman against contact or proximity to an energized conductor, said inner and outer housings being curved to be roughly concentric to provide said air gap, and each housing having an attaching flange for securement to an insulating pole, said inner housing and outer housing being joined at said attaching flanges and the air gap between said housings being traversed adjacent said attaching flanges by a portion of said outer housing secured to said inner housing to close said air gap against access by said conductor, said outer housing having an upwardly extending flange extending into said inner housing, and forming an upwardly tapered closed access slot for passing said conductor laterally into the inner housing.

4. A hot line guard, comprising an elongated member of rigid but resilient electrically insulating plastic material, said guard having an outer housing member open at its ends and an inner housing member at its open ends, said housing members being spaced from each other to provide a double insulating wall, and an air gap between them for insulating a conductor located in the inner housing, to protect a lineman against contact or proximity to an energized conductor, said inner and outer housings being curved to be roughly concentric to provide said air gap, and each housing having an attaching flange for securement to an insulating pole, said inner housing and outer housing being joined at said attaching flanges and the air gap between said housings being traversed adjacent said attaching flanges by a portion of said outer housing secured to said inner housing to close said air gap against access by said conductor, said outer housing having an upwardly extending flange extending into said inner housing, and forming an upwardly tapered closed access slot for passing said conductor laterally into the inner housing, said guard having a female opening at one end and a male formation at the other end thereof, and adapted to be received in the female end of a similar guard.

5. A hot line guard, comprising an elongated member of rigid but resilient electrically insulating plastic material, said guard having an outer housing member open at its ends and an inner housing member open at its ends, said housing members being spaced from each other to provide a double insulating wall, and an air gap between them for insulating a conductor located in the inner housing, to protect a lineman against contact or proximity to an energized conductor, said inner and outer housings being curved to be roughly concentric to provide said air gap, and each housing having an attaching flange for securement to an insulating pole, said inner housing and outer housing being joined at said attaching flanges and the air gap between said housings being traversed adjacent said attaching flanges by a portion of said outer housing secured to said inner housing to close said air gap against access by said conductor, said outer housing having an upwardly extending flange extending into said inner housing, and forming an upwardly tapered closed access slot for passing said conductor laterally into the inner housing, said guard having a female opening at one end and a male formation at the other end thereof, and adapted to be received in the female end of a similar guard, said guard having bottom open slots at each end adapted to pass insulator supporting pins.

6. A hot line guard, comprising an elongated member of rigid but resilient electrically insulating plastic material, said guard having an outer housing member open at its ends and an inner housing member, said housing members being spaced from each other to provide a double insulating wall, and an air gap between them for insulating a conductor located in the inner housing, to protect a lineman against contact or proximity to an energized conductor, said inner and outer housings being curved to be roughly concentric to provide said air gap, and each housing having an attaching portion for securement to an insulating pole, said inner housing and outer housing being joined at both the lower edges of said outer and inner housing to close said air gap against access by said conductor, said inner housing having a movable upwardly extending flange resiliently engaging the inside of said inner housing, forming a closed but spreadable tapered access slot for admitting said conductor, and preventing the conductor from emerging except by an upward push of the guard.

7. A hot line guard, comprising an elongated member of rigid but resilient electrically insulating plastic material, said guard having an outer housing member open at its ends and an inner housing member, said housing members being spaced from each other to provide a double insulating wall, and an air gap between them for insulating a conductor located in the inner housing, to protect a lineman against contact or proximity to an energized conductor, said inner and outer housings being curved to be roughly concentric to provide said air gap, and each housing having an attaching portion for securement to an insulating pole, said inner housing and outer housing being joined at both the lower edges of said outer and inner housing to close said air gap against access by said conductor, said inner housing having a movable upwardly extending flange resiliently engaging the inside of said inner housing, forming a closed but spreadable tapered access slot for admitting said conductor, and preventing the conductor from emerging except by an upward push of the guard, said flange also engaging the inner housing at its entrance, to provide a double safety factor against the conductor getting out of the guard.

8. In a line guard assembly, the combination of an insulating support with a stiff, resilient, elongated insulating member of sheet material, forming an inner housing and an outer housing about an electric line conductor, said housings comprising a pair of separate, round and concentric tubular members of different diameters, forming two walls of insulation with an air gap between them on all sides, with the walls supported and spaced from each other by a pair of radially extending supporting flanges secured together on the lower side of the assembly, the outer wall being turned inwardly on said lower side into engagement with the inside of the inner wall, forming a tapered but closed resilient access slot for passing an electric conductor into the inner housing.

9. A line guard assembly according to claim 8, in which said inwardly turned portion of said outer wall has a second line of resilient engagement with the inside of the inner wall, forming a second tapered access slot for passing said conductor, and providing a factor of safety in retaining the guard on the line.

10. A line guard assembly according to claim 8, in which said inwardly turned portion of said outer wall is directed across a segment of the inner wall, engaging the inner housing at the point of its attachment to said radial supporting flange, and engaging said inner housing inwardly of said latter point, where the inwardly turned portion has an inwardly extending camming portion for engagement with the conductor in forcing the conductor out of the inner housing.

11. A line guard assembly according to claim 8, in which the inner housing is shorter than the outer housing, and the outer housing has a female enlargement at one end and a male extension at the other end for closed engagement, one in the other, on similar guards.

12. A line guard assembly according to claim 11, in which the attaching flanges are cut away at the ends of the assembly to receive a cross arm below two joined guards at the adjoining ends thereof, which ends are also

belled out in the outer housing to make space to receive an insulator carried by the cross arm and supporting the conductor.

13. A line guard assembly according to claim 8, in which said inner and outer walls are also definitely spaced and supported relative to each other by insulating spacing members extending outwardly from the inner wall to the outer wall.

14. A line guard assembly according to claim 13, in which the spacing members are provided with attaching flanges and are of U-shaped formation and secured to the inner and the outer walls at the attaching flanges and yokes of said U-shaped formations.

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