July 20, 1965 H. H. GATES 3,196,204

INSULATOR STRING AND BONDING BRUSH

Filed March 26, 1963

FIG. 1

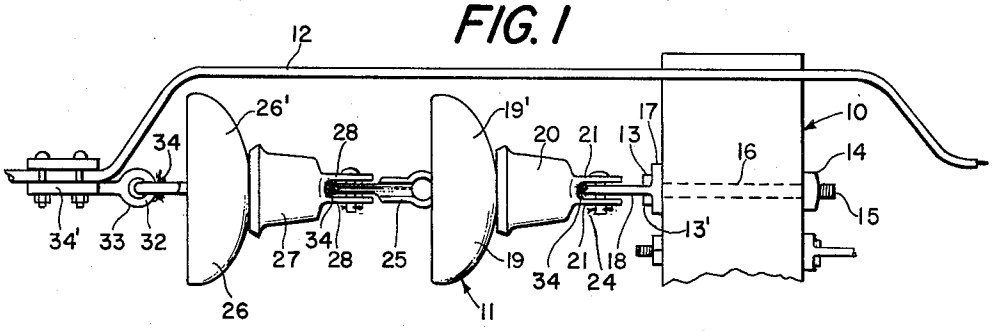


FIG. 2

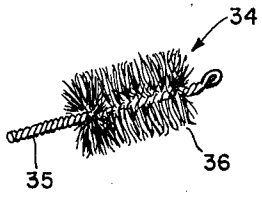


FIG. 3

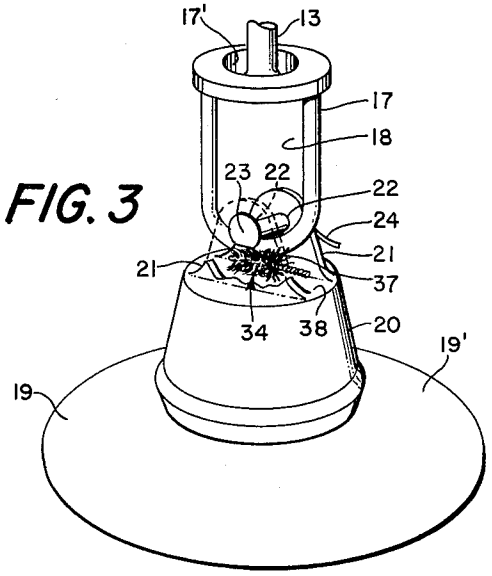


FIG. 4

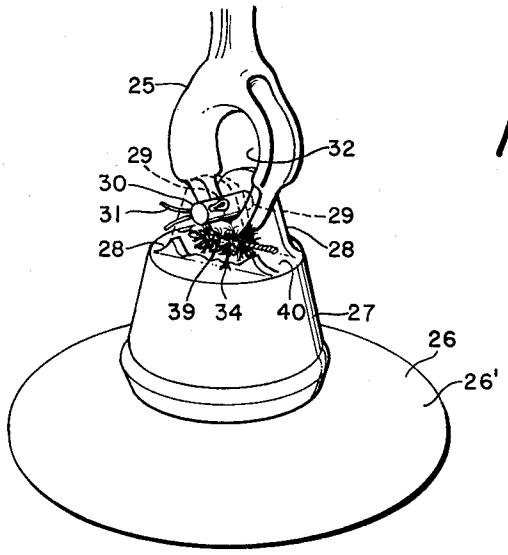
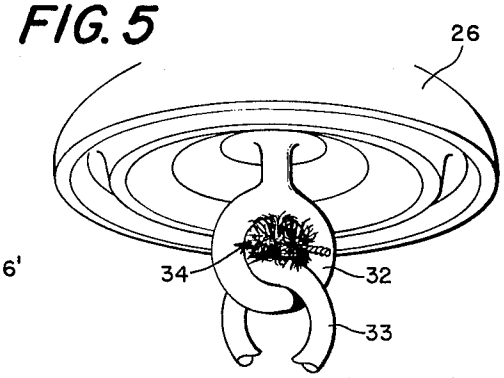


FIG. 5



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INSULATOR STRING AND BONDING BRUSH

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The present invention relates to a bonding brush for insertion into existing insulator strings to thereby eliminate electrical interference induced in radio and television transmission lines supported by said insulator strings.

As is well known electrical transmission lines for carrying radio and television intelligence are supported between transmission poles. In order to fasten transmission lines to such poles without grounding them, insulator strings are used. These insulator strings consist of a plurality of ceramic insulators each having metallic links extending from opposite sides thereof, said links of each ceramic portion being electrically insulated from each other by said ceramic portion. Links of adjacent ceramic insulators are joined to each other to thereby build up a string of insulators between a transmission line which is secured to one end of said string and a transmission pole which supports the other end of said string. The metallic links are usually fabricated from cast iron material which is strongly magnetic. A certain amount of looseness must be permitted between adjacent joined metallic links to permit the portions of the transmission lines hanging between adjacent transmission poles to sway with the wind without breaking. Ordinarily when there is no wind the mere weight of the portion of the transmission line between adjacent poles is sufficient to keep the joined metallic links of the insulator strings in firm engagement. However, when swaying of the transmission lines is experienced, the degree of contact between the joined metallic links of the insulator strings changes. This fluctuation in the degree of engagement produces arcing and electrical discharges which in turn causes interference in the transmission lines. The electrical discharging and arcing results from the fact that the transmission lines generate strong magnetic fields in the vicinity of the insulator strings and therefore induce high electrical charges in the joined magnetic links of said insulator strings. As the degree of contact between the interlinked metallic members changes due to the swaying of the transmission lines, the electrical charges to which they have been subjected discharge and induce electrical disturbances in the transmission lines which results in radio and television interference. It is with the elimination of the electrical interference produced in the above-described manner that the present invention is concerned.

It is accordingly the primary object of the present invention to provide a bonding brush which is capable of being inserted in an extremely simple manner relative to joined metallic links of an insulator string to thereby cause them to maintain good electrical contact with each other under all conditions and thereby eliminate the possibility of their producing electrical discharges which cause radio and television interference.

It is another object of the present invention to provide a bonding brush for insertion relative to joined metallic members of an insulator string which, incidental to their insertion, clean scale and corrosion from the metallic surfaces engaged by said bonding brush to thereby provide good electrical contact between said joined links. A related object of the present invention is to provide a bonding brush which pierces the scale of joined links to thereby provide good electrical contact therebetween. A further related object of the present invention is to provide a bonding brush having sharp bristles thereon

which after having been pushed between adjacent metallic links provides a continuous cleaning action as said links move relative to each other during the swaying of the transmission lines, to thereby continually remove scale which forms on said links which would reduce the electrical conductivity provided between said links by said brush.

Another object of the present invention is to provide a bonding brush having resilient conductive bristles for insertion between metallic links of an insulator string which permits a single sized brush to be used with various types of links. A related object of the present invention is to provide a bonding brush having resilient bristles which maintain it in position after it has been inserted in a space between joined links. A further related object of the present invention is to provide a bonding brush for insertion between adjacent metallic links of an insulator string, said bonding brush having resilient bristles which cause good electrical bonding between said links even when said links move relative to each other as a result of the swaying of the transmission lines carried by said insulator strings. Other objects and attendant advantages of the present invention will readily be perceived hereafter.

The bonding brush of the present invention includes a twisted brass wire core having resilient Phosphor bronze bristles extending therefrom, the outer periphery of said bristles being of cylindrical configuration. The bristles are preferably corrugated to thereby increase the degree of contact between adjacent bristles and thereby insure a low resistance electrical path through said brush. The stem of said brush is of a configuration which permits it to be engaged by a suitable tool for insertion between adjacent metallic links of an insulator string. The above-mentioned bristles are resilient and therefore maintain good electrical contact between links which move relative to each other. Furthermore, it is the resilience of the bristles themselves which maintains the brush in engagement with the links to thereby obviate the use of other mechanical connections for maintaining the brush in engagement with said links once it has been inserted. The outer peripheral portions of the bristles are sharp and therefore, during the process of insertion of the brush, not only clean the scale from the adjacent metallic links but also pierce scale which is not cleaned to thereby cause said brush to provide a good conductive path between said links. In addition, the brush provides a self-cleaning action in the sense that as scale tends to form on the adjacent metallic links of the insulator string, the swaying of the wires held by said insulator strings will cause relative movement between the brush and the metallic links to thereby tend to provide continuous cleaning of the adjacent surfaces and thereby maintain a good electrical path between said links. The present invention will be more fully understood when the following portions of the specification are read in conjunction with the accompanying drawings wherein:

FIG. 1 is a fragmentary plan view showing an insulator string mounted on a transmission pole and supporting a transmission line;

FIG. 2 is a perspective view of the improved bonding brush of the present invention;

FIG. 3 is a fragmentary perspective view showing how the bonding brush of the present invention fits relative to one type of joined links of an insulator string, portions of said links being broken away in the interest of clarity;

FIG. 4 is a fragmentary perspective view showing how the bonding brush fits relative to another type of joined links of an insulator string, portions of said links being broken away in the interest of clarity; and

FIG. 5 is a fragmentary perspective view showing how

the bonding brush of the present invention fits relative to still another type of joined links of an insulator string, portions of said links being broken away in the interest of clarity.

In FIG. 1 a portion of cross tie 10 of a transmission pole is shown in plan. An insulator string 11 has one end thereof attached to cross tie 10 and the other end thereof supporting transmission line 12. The insulator string includes a bolt 13 which fits through aperture 16 in cross tie 10. The head 13' of bolt 13 engages one surface of collar 17' of link 17 and the other surface of collar 17' is forced into engagement with cross tie 10 when nut 14 is tightened onto the threaded end 15 of bolt 13. A loop 18 (FIG. 3) forms an integral part of link 17 and loop 18 supports ceramic insulator 19.

Ceramic insulator 19 has a cast iron metallic connecting member 20 with one end thereof embedded in said ceramic portion 19' and the other end formed with upstanding ears 21 having apertures 22 therein. A pin 23 extends through apertures 22 and through the inside of loop 18, said pin having a head portion (not numbered) which is larger than said apertures 22. A cotter-pin 24, extends through the shank of pin 23 and thereby retains pin 23 in position.

A metallic link such as loop 25 has one end thereof embedded in ceramic portion 19' (FIG. 1) and the other end thereof extending toward ceramic insulator 26. Insulator 26 in turn has a ceramic portion 26' in which one end of cast iron link 27 is embedded. The other end of cast iron portion 27 has upstanding ears 28 having aligned apertures 29 therein through which pin 30 is adapted to extend. A cotter pin 31 holds pin 30 in said aligned apertures 29. The central portion of pin 30 fits through loop 32 of link 25.

The end of insulator 26 remote from link 27 has a loop 32 (FIG. 5) embedded therein, loop 32 being in interlinked engagement with loop 33 forming a part of clamp 34 (FIG. 1) which firmly holds transmission line 12.

As can readily be visualized from FIG. 1, another insulator string is located on the opposite side of cross tie 10 from insulator string 11 and said other insulator string, not shown, has parts which correspond to those of insulator string 11. By fastening portions of transmission line 12 to brackets such as 34 on the above-described opposed insulator strings, the transmission line is supported by cross tie 10 without being in electrical engagement therewith. In this manner grounding of transmission line 12 is prevented.

In accordance with the present invention a bonding brush 34 (FIG. 2) is provided having a twisted brass wire stem or core 35 and corrugated resilient Phosphor bronze bristles 36 supported thereby, said bristles being in the configuration of a cylinder. As can readily be seen from FIGS. 3, 4, and 5 the outer diameter of brush 34 is greater than the maximum spacing between surface 37 of loop 18 and surface 38 of link 20 (FIG. 3). Furthermore the outer diameter of brush 34 is greater than the distance between surface 39 of link 25 and surface 40 of link 27 (FIG. 4). As can be seen from FIG. 5, the space in which bonding brush 34 is inserted relative to loops 32 and 33 is less than the diameter of bonding brush 34. Thus in all of the joints of FIGS. 3, 4, and 5, once bonding brush 34 is inserted, the central portion thereof will tend to yield and the end portions of said brush will tend to maintain their original diameter. Because the end portions do retain their original diameter and because bristles 36 are resilient, the oversized aspect of the brush itself relative to the various apertures in which it is inserted causes the brush to remain in the positions in which it was inserted without the use of other securing means.

It can readily be seen that the links comprising the joints of FIGS. 3, 4, and 5 can have relative movement therebetween. However notwithstanding this relative movement, brushes 34 remain in firm electrical engagement with each of the joined links because the resiliency

of the bristles causes the brush to accommodate itself to the various relative orientations which adjacent links assume during the swaying of transmission line 12.

In addition, it is to be noted that bristles 36 have sharp outer points so that when they are inserted these sharp outer points tend to remove scale formed by corrosion which is on the portions of adjacent links contacted by said brush. Furthermore since the bristles are sharp they will penetrate any corrosion which is not thus removed. In this manner good electrical contact is obtained between the joined links of FIGS. 3, 4, and 5.

It will also be noted that because of the resilience of the bristles 36, the latter will tend to remain in firm engagement with the joined links of FIG. 3, 4 and 5 during relative movement therebetween, and, further, when there is relative movement between the joined links and brush 34, the sharp points of the bristles 36 will provide a self-cleaning action which tends to remove scale which forms on the portions of such links engaged by brush 34.

The bristles 36 of the brush 34 are corrugated. This causes them to be forced into good engagement with each other becaues they are matted together when they are forced into a space which is smaller than the outer diameter of the brush before it is deformed.

In order to insert brushes 34 between the adjacent links at which they are shown in FIGS. 3, 4, and 5, it is merely necessary to grasp stems 35 of said brushes with a suitable tool to force said brushes into position. It will be appreciated that brushes 34 are inserted in existing transmission lines in the locations shown and this is most conveniently done by the use of a suitable tool for grasping stem 35, said tool being mounted at the end of a "hot stick" which is essentially a pole which is grasped by a person standing on a lift of a truck, or the like.

While bristles 36 of brush 34 have been described as being corrugated, it will be appreciated that this term encompasses the making of the bristles in a wavy form which does not conform to any predetermined pattern. It will also be appreciated that bristles 36 may also be of any other configuration which will provide the desired result of positive electrical bonding between joined links of an insulator string.

It can thus be seen that the bonding brush of the present invention is manifestly capable of achieving the above-enumerated objects, and while a preferred embodiment has been disclosed, it can readily be understood that the present invention is not restricted thereto, but may be otherwise embodied within the scope of the following claims.

I claim:

1. In combination: an insulator string containing movable joined conductive portions and a bonding brush between said movable portions for maintaining a substantially constant conductive path between joined conductive portions of adjacent insulating elements of the insulator string, said brush comprising a core, resilient conductive bristles secured to said core and placed into firm conductive engagement with portions of said joined conductive portions of said insulating elements, said resilient conductive bristles being capable of yielding during insertion between said conductive elements and yieldingly engaging said joined conductive portions to thereby maintain said substantially constant conductive path as said joined conductive portions experience relative movement.

2. In combination: an insulator string containing movable joined conductive portions and a bonding brush between said movable portions for maintaining a substantially constant conductive path between joined conductive portions of adjacent insulating elements of the insulator string, said brush comprising a core, and resilient conductive bristles embedded in said core and having sharp outer ends for removing loose scale from said joined conductive portions during insertion of said brush therebetween and for piercing scale not removed from said joined

conductive portions, to thereby provide good electrical contact between said joined conductive portions to thereby minimize the voltage discharges which create electrical interference in a power line supported by said insulator string.

3. In combination: an insulator string containing movable joined conductive portions and a bonding brush between said movable portions for maintaining a substantially constant conductive path between joined conductive portions of adjacent insulating elements of the insulator string, said brush comprising a core, and resilient corrugated conductive bristles secured to said core and placed into firm conductive engagement with said joined conductive portions of said insulating elements, said brush having an outer diameter which is greater than the space between portions of said joined conductive portions, said corrugations of said bristles causing said bristles to mat into firm electrical engagement with each other when located in said space between said adjacent conductive portions to thereby provide said substantially constant conductve path between said joined conductive portions.

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