July 18, 1961 D. F. WINTER 2,993,146

TRANSFORMER LIGHTNING ARRESTER SYSTEM

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FIG. 1.

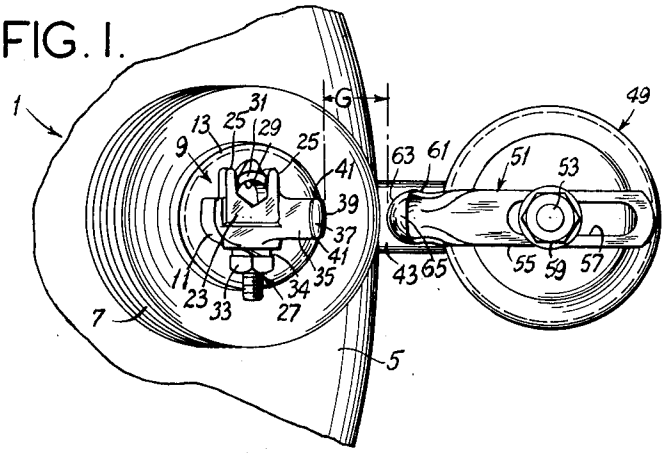
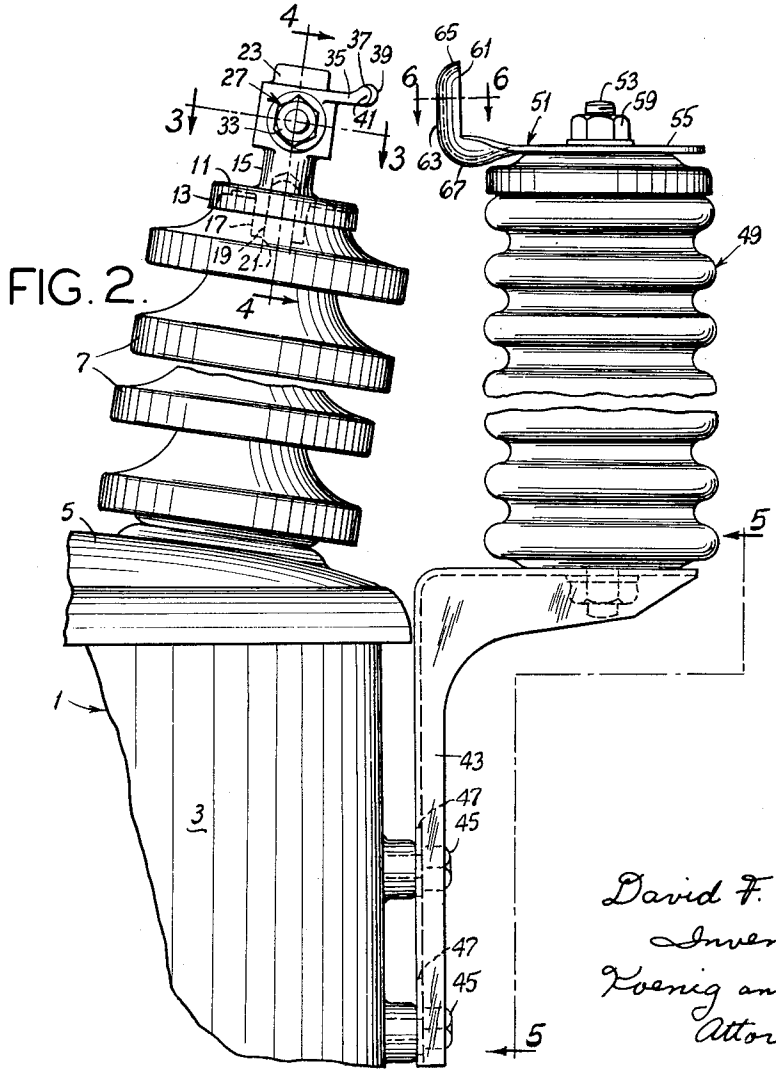


FIG. 2.



David F. Winter,
Inventor.
Koenig and Pope,
Attorneys.

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FIG. 3.

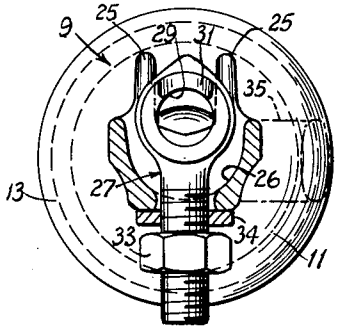


FIG. 4.

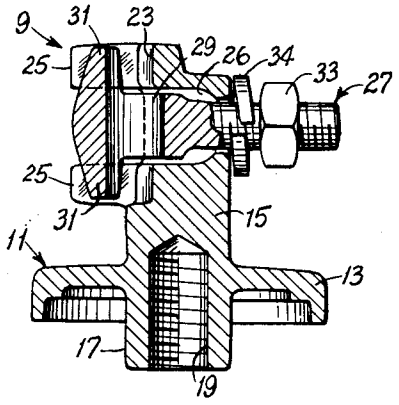


FIG. 6.

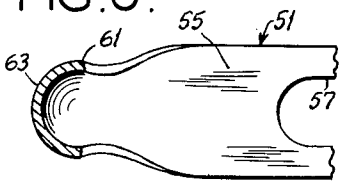


FIG. 5.

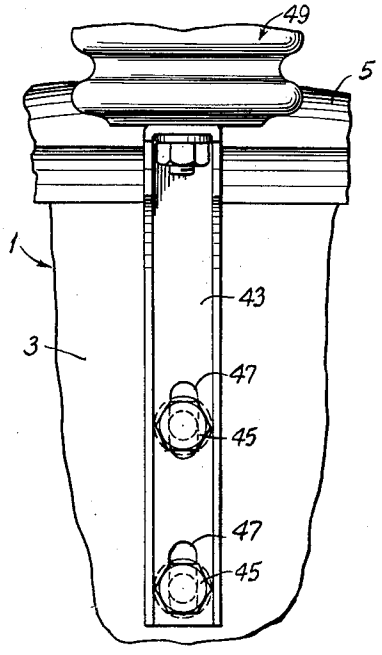
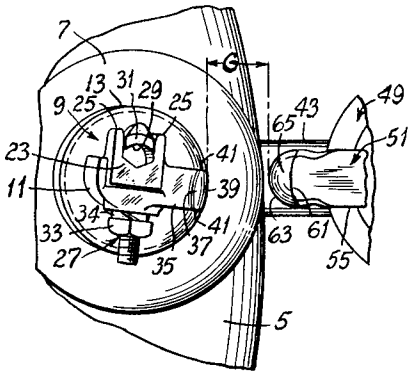


FIG. 7.



David F. Winter
Inventor.
Koenig and Pope,
Attorneys.

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2,993,146
TRANSFORMER LIGHTNING ARRESTER SYSTEM

David F. Winter, Kirkwood, Mo., assignor to Moloney Electric Company, St. Louis, Mo., a corporation of Delaware

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1 Claim. (Cl. 317—15)

This invention relates to transformers, and more particularly to lightning arrester systems for transformers.

The invention is particularly concerned with a lightning arrester system for a transformer comprising the usual tank having a cover and a bushing extending upward from the cover, the bushing having a line wire connector at its upper end. A lightning arrester is mounted on the tank for vertical adjustment thereon extending upward alongside the bushing. The lightning arrester is grounded to the tank. The system includes a first electrode extending laterally from the connector and a second electrode extending laterally from the upper end of the lightning arrester toward the first electrode with the ends of the electrodes opposed to one another and with a gap therebetween. For proper operation of the system, this gap must be accurately established and maintained. In this respect, it is to be observed that the bushing is rotatable on its axis and hence that the electrode on the connector is rotatable with the bushing around the axis of the bushing. Accordingly, the bushing must be initially rotated to bring the connector electrode into an angular position wherein its end is opposed to the end of the arrester electrode. Then the bushing is subject to inadvertent rotation such as to result in a change in the initially established angular position of the connector electrode. The principal object of this invention is the provision of a construction such that the gap may be accurately established without any necessity for any fine adjustment of the angular position of the connector electrode, and such that rotation of the bushing and connector electrode, within limits, after the initial setting, will not result in any significant change in the gap, and also such that vertical adjustment of the lightning arrester may be made without significantly changing the gap. A further object of the invention is the provision of a construction which is such as to inhibit corona. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claim.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a plan view of a lightning arrester system of this invention;

FIG. 2 is a view in side elevation of the system;

FIGS. 3 and 4 are enlarged cross sections taken on lines 3—3 and 4—4, respectively, of FIG. 2;

FIG. 5 is a fragmentary elevation as viewed from the right of FIG. 2;

FIG. 6 is an enlarged section taken on line 6—6 of FIG. 2; and

FIG. 7 is a view similar to FIG. 1 illustrating a moved position of parts.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, the invention is shown in its application to a transformer generally indicated at 1 comprising a tank 3 having a cover 5. A terminal bushing 7 extends up from the cover 5, being inclined outward. This bushing, as shown, may be a conventional porcelain bushing. It is mounted on the cover 5 in any suitable conventional manner such that it is capable of being rotated on its axis. At the upper end of the bushing is an electrically conductive line wire connector 9. This connector comprises a metal body casting 11 formed to provide a circular base 13 which seats on the upper end of the bushing, a stem portion 15 extending up from the base, and a stem portion 17 extending down from the base. Stem portions 15 and 17 have a tapped hole 19 therein by means of which the body 11 is threaded on the upper end of a rod indicated at 21 in FIG. 2 which extends through the bushing.

The upper end of stem portion 15 is formed as a fixed jaw 23 with upper and lower U-shaped end portions 25. The jaw 23 is formed with an opening 26 receiving an eyebolt 27. The eye 29 of the eyebolt is slidable between the two U-shaped end portions 25 and has fingers 31 extending into the U-shaped end portions to hold the eyebolt against rotation. A clamping nut 33 is threaded on the shank of the eyebolt, a lock washer 34 being interposed between the nut and the fixed jaw 23. By loosening the nut, the eye of the eyebolt may be moved outward to receive a line wire inserted downward through the eye, after which the nut is tightened to clamp the wire against the fixed jaw 23.

In accordance with this invention, the body 11 of the connector is formed with a laterally extending arm 35 which constitutes an electrode. This arm is generally flat, lying in a plane perpendicular to the axis of the bushing and the body 11 (i.e., the axis of rod 21 and stem portions 15 and 17). The outer end of the arm is formed with a bead portion 37 generally of circular cross section, whereby the outer end edge 39 of the arm is of convexly rounded form in cross sections on radial planes through the axis of the bushing. Also, end edge 39 is curved in plan generally on an arc substantially centered in the axis of the body and bushing (see FIGS. 1 and 7). Also, the bead has rounded end portions or corners such as indicated at 41.

A bracket 43 is shown as mounted on the side of the tank 3 for vertical adjustment by means of screws 45 extending through elongate vertical slots 47 in the bracket. Carried by the bracket and extending vertically upward therefrom alongside the bushing 7 is a lightning arrester 49. Any suitable type of lightning arrester may be used. At the upper end of the lightning arrester is an electrode 51. The lightning arrester has a screw-threaded rod 53 extending from its upper end. The electrode 51 comprises a bar 55 having a longitudinal slot 57 receiving the rod 53 and held on the upper end of the arrester in position extending laterally outward from the arrester by means of a nut 59 threaded on rod 53. Bar 55 has an outer end portion 61 bent to extend upward at right angles to the length of the bar. The outer face 63 of the upwardly extending end portion 61 of the electrode is shown as being convexly curved in plan and as having rounded upper and lower ends 65 and 67. End portion 61 is of greater height than the bead 37. End portion 61 could be substantially flat in the vertical plane instead of convexly curved in plan as shown, with rounded upper and lower ends and edges in the gap region.

As shown in FIG. 1, the arrester electrode 55 extends laterally inward from the upper end of the lightning arrester 49 toward the connector electrode 35 with the ends of the two electrodes opposed to one another and with a gap G therebetween, the gap being the shortest distance between the edge 39 of bead 37 and the face 63 of electrode 55. The gap is established by loosening nut 59 and sliding electrode 55 back or forth as required for the proper spacing of bead 37 and face 63 as determined by the lightning arrester rating. The required height for bead 37 above the top of the tank is also determined by the lightning arrester rating. The lightning arrester bracket 43 is adjusted up or down to posi-

tion face 63 of electrode 55 opposite the bead, considerable latitude being permitted in this adjustment because of the height of end portion 61 of electrode 55 and because the arrangement is such that changing the vertical position of end portion 61 relative to the bead within a relatively wide range does not change the gap G. The bushing 7 and electrode 55 are turned so that electrodes 35 and 55 are generally in line. They need not be exactly in line since, with the edge 39 of bead 37 curved on an arc centered in the axis of the bushing, different angular positioning of the electrode 35 about the axis of the bushing, within limits, does not significantly change the gap (compare FIGS. 1 and 7). Accordingly, the initial adjustments for establishing the proper gap are easy to make, no fine adjustments being required, and if, for example, the connector electrode should be inadvertently turned slightly after the initial adjustment has been made, no change is made in the gap. Similarly, no change is made if electrode 55 should be inadvertently turned. With the corners 41 of bead 37 rounded and the upper and lower ends 65 and 67 of the end portion 61 of electrode 55 rounded, corona is substantially eliminated.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

A lightning arrester system for a transformer of the type comprising a tank having a cover and a bushing extending upward from the cover, said bushing having a connector on its upper end, said connector comprising a metal body formed to provide a fixed jaw and means

for clamping a wire to said jaw, said system comprising an arm formed integrally with said body extending laterally outward therefrom and constituting a first electrode, the width of the arm being greater than its height, a bracket mounted on the outside of the tank for vertical adjustment thereon, a lightning arrester extending upward from said bracket alongside the bushing, and a second electrode extending laterally inward from the upper end of the lightning arrester toward the arm with the end of the arm and the end of the second electrode opposed to one another and with a gap therebetween, said arm having a rounded bead at its end, the outer edge of said bead being curved in plan on an arc substantially centered in the axis of the bushing whereby different angular positioning of the arm about the axis of the bushing, within limits, does not change the gap, the bead also being convexly rounded in cross sections on radial planes through the axis of the bushing, and said bead having rounded corners, said second electrode comprising a bar having an end portion bent to extend generally vertically, said end portion being of substantially greater height than the height of said bead and being substantially flat in the vertical plane and having rounded upper and lower ends and edges in the gap region whereby vertical adjustment of the lightning arrester may be made without significantly changing said gap, said lightning arrester having a threaded rod extending from its upper end, said bar having a longitudinal slot receiving said rod, and a nut threaded on the rod holding said bar in adjusted position on the arrester.

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