Nov. 25, 1941. R. H. EARLE 2,263,620

HOUSING FOR LIGHTNING ARRESTERS

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Fig. 2

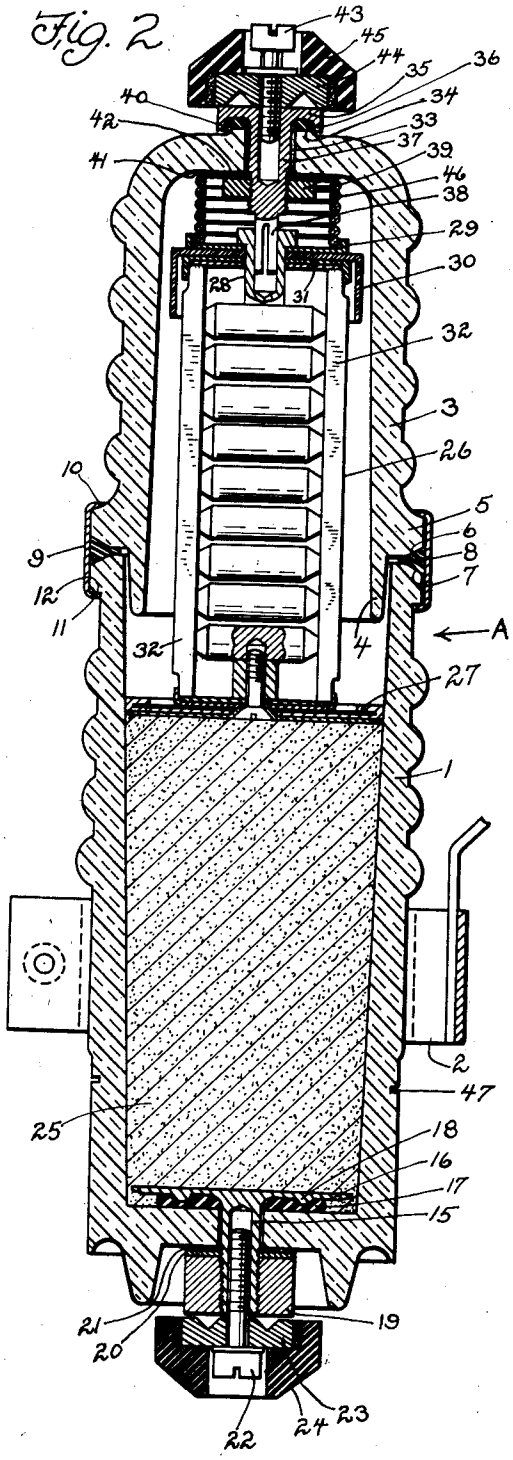
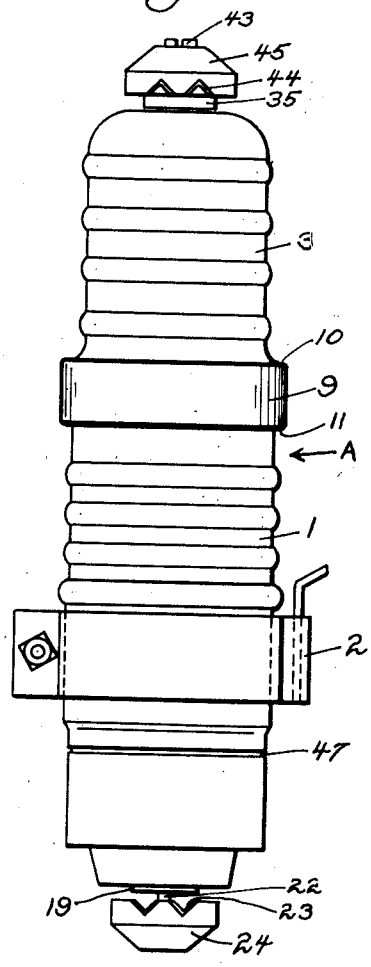


Fig. 1



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HOUSING FOR LIGHTNING ARRESTERS

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10 Claims. (Cl. 175—30)

This invention relates to improvements in housings and assemblies for lightning arresters.

It is an object of this invention to provide for lightning arresters designed to protect electric transmission lines operating on voltages of a magnitude greater than 6,000, a sectional housing which will facilitate the manufacture and assembly of the arrester, which will be moisture-proof, and which will offer a maximum flash-over path at the point of juncture of the housing sections.

Heretofore, it has been impractical to provide glass housings for arresters designed for voltage ratings higher than 6,000 because of the fact that the molding of a single-piece glass container for such arresters resulted in such a large percentage of defective containers as to render the cost prohibitive.

Accordingly, another object of this invention is to provide a sectional housing for lightning arresters which permits the molding of glass in separate sections of convenient size, thereby minimizing the percentage of defective parts and rendering the cost of producing a sectional housing of glass comparable with that of other materials.

A more specific object of this invention is to provide for sectional housings, a point of juncture designed to insure that the flashover voltage through this point of juncture to the supporting structure exteriorly of the housing, is greater than the voltage at the path through the valve material in the arrester and in proximity to the point of juncture of the housing sections.

Another object is to provide yieldable pressure-applying means coacting between the internal arrester parts and the housing sections adapted to compensate for dimensional variations that occur in the sections when manufactured and for differences in dimensions between the housing sections and the internal arrester parts that may occur under the influence of temperature changes.

A further object is to provide relatively movable contact means internally of the arrester housing which will compensate for dimensional variations in the arrester, but which will at all times maintain electrical connection between the internal parts and the external line terminal structure.

A still further object is to provide for the housing sections at their line of juncture, an effective seal against the entrance of moisture and a cushion for avoiding damage to adjacent ends of the sections.

In the drawing:

Fig. 1 is a view in side elevation showing an assembled embodiment of my invention.

Fig. 2 is an enlarged vertical section of the device shown in Fig. 1.

In the embodiment of my invention shown in the drawing, the housing A comprises a lower cup-like section 1 embraced by a support 2 and an upper inverted cup-like section 3 having a skirt or barrier 4 extending into the upper end of the section 1. The section 3 is provided with a flange 5 extending over the upper margin of the section 1 and having a beveled edge 6 which in effect forms with beveled edge 7 on the section 1 an annular V groove. Disposed between the upper margin of the section 1 and the flange 5, is a resilient sealing washer 8 that conforms to the V groove and serves to prevent moisture from entering the housing at the juncture of the sections 1 and 3. As indicated, the sections 1 and 3 are held in contact with the washer 8 by means of the metal band 9 which has its margins 10 and 11 extending over the flange 5 and the flange or shoulder 12, respectively.

The assembly at the lower end of the arrester is similar to that disclosed in my joint application with Alwin G. Steinmayer, Serial No. 72,734, filed April 4, 1936, but will be briefly described here.

The bottom of the section 1 is apertured to receive the tubular shank 15 of the disk-like electrode 16 which rests on the rubber disk washer 17 between it and the bottom of the section 1. Preferably the electrode 16 is provided with an annular rib 18 which is drawn into the washer 17 as will hereafter appear. The electrode 16 is drawn into engagement with the washer 17 by means of a nut 19 threaded on the shank 15 and provided with a metal washer 20 to permit free rotation of the nut and with a rubber washer 21 to allow for inequalities in the surfaces of the arrester bottom and to cooperate with the washer 17 in effectively sealing the lower end of the arrester against the entrance of moisture. A ground wire may be connected to the electrode 16 by means of a clamping bolt 22 which is threaded into the shank 15 and supports a transversely grooved clamping plate 23 having an insulating cap 24 mounted thereon.

The housing section 1 is filled with a column of granular valve material 25 such as silicon carbide which, under normal operating conditions, offers a comparatively high resistance to the flow of current therethrough, but under normally high voltages, offers a decreased resistance. As indicated, the upper end of the material 25 is disposed a distance below the upper margin of the section 1 and the skirt 4.

A gap device 26, similar to that disclosed in the aforementioned application Serial No. 72,734, is mounted on the upper end of the column of valve material 25 and is provided with

an electrode 27 for contacting the valve material and preventing the granules of valve material from entering the upper portion of the housing. This electrode 27 is specifically described and claimed in the application of Walter E. Mittelstadt, Serial No. 74,880, filed April 17, 1936, and therefore it is not deemed necessary to here describe it in detail.

The upper end of the gap device 26 is provided with a headed hollow terminal member 28 which retains the spring cup 29, shielding skirt 30 and spacing plates 31 securely in position on the supporting columns 32. It has been found that the shielding skirt 30 effectively prevents radio interference that may otherwise occur by reason of the contacts between the plates 31 and the upper ends of the columns 32. The upper section 2 of the housing is apertured at 33 and is provided with a boss 34 disposed about the aperture. A contact disk 35 having a depending skirt 36 is provided with a hollow terminal shank 37 extending through the aperture 33 and having a bifurcated end 38 extending into the hollow terminal 28. A nut 39 threaded on the shank 37 holds the disk 35 in compressive contact with the rubber sealing washer 40 and forces the cupped resilient washer 41 in contact with the top of the section 3 and the rubber washer 42. As will be obvious, the washer 40 seals the aperture 33 against the entrance of moisture into the housing.

A clamping bolt 43 is threaded into the hollow shank 37 and slidably mounted thereon is a transversely grooved clamping plate 44 for securing a high-tension lead wire thereto. An insulating cover 45 is secured to the plate 44.

A coil spring 46 is held under compression between the spring cup 29 and the washer 41 serves to maintain the gap device 26 and valve material 25 in proper relationship at all times, irrespective of any dimensional differences that may result due to temperature changes. In order to compensate for differences resulting between the housing A and the internal assembly, the bifurcated end 38 of the shank 37 is fitted slidably in tubular terminal 28.

The lower portion of the housing section 1 is provided with a groove 47 below the support 2 which is cut in the outer peripheral surface by any suitable glass cutting means to a depth sufficient to break the surface tension and to provide a line of cleavage where the lower portion of the section 1 will rupture when overheated by a continued flow of follow current through the valve material after discharge of abnormal line voltages.

Assembly of the arrester is accomplished in the following described manner: After the electrode 16 and terminal shank 37 have been mounted on the sections 1 and 3, respectively, and the valve material 25 and gap device 26 have been mounted in the section 1 in a manner similar to that disclosed in the copending application of Walter E. Mittelstadt, Serial No. 74,880, the two sections 1 and 3 of the housing will be placed as shown in Fig. 2 with the rubber sealing washer 8 between them. Preferably the washer 8 is coated with rubber cement to insure close adhesion of the washer to the adjacent surfaces 6 and 7. As will be understood, the band 9, prior to mounting as shown, is provided with one inturned flange 10 to permit the band to be disposed about the washer 8 and with the flange 10 in contact with the flange 5 on the housing section 3. When the band has been placed in the position shown, the housing sections 1 and 3 are subjected to sufficient endwise pressure to compress the washer 8 and force radial expansion thereof. While the washer 8 is thus under stress, the lower inturned flange 11 is spun over the shoulder 12 and thereafter cooperates to hold the sections in compressive relation to the washer.

As will be apparent from the disclosure, the washer 8 prevents contact of the flange 5 with the upper margin of the section 1 and insures that damage to the housing will not occur during assembly of the sections and thereafter.

Obviously, when the arrester is being assembled as described, the spring 46 will be compressed and will thereafter hold the gap device 26 and valve material in proper relation to each other and will compensate for any dimensional differences existing before assembly or thereafter.

It has been found that by beveling the sections 1 and 3 as shown at 7 and 6, respectively, and conforming the washer 8 thereto, a more effective seal is obtained than otherwise. This may be attributed to the fact that the washer, due to its inherent resiliency, is permitted to adjust itself internally as well as radially under the influence of any variations resulting in the point of juncture of the sections 1 and 3 and the band 9.

The skirt 4 on the section 3 of the housing shields the plane of juncture between the sections 1 and 3 and increases the length of the flash-over path between the adjacent gap assembly 26 to the band 9 and from there to the support 2 to an amount greater than the length of such path would be if the skirt were not provided. Preferably, the skirt 4 is made sufficiently long to make a flash-over path from the gap assembly 26 to the support 2 requiring a voltage greater than that of the path through the valve material 25, thus insuring that all discharges through the arrester will pass through the valve material in preference to a path through the point of juncture of the housing sections.

From the foregoing, it will be apparent that a lightning arrester designed to operate on voltages greater than 6,000 has been provided in which the housing may be sectionalized, may be made in glass sections facilitating the molding of the glass, which is effectively sealed against the entrance of moisture and offers a maximum flash-over path at the point of juncture of the housing sections, in which yieldable pressure-applying means compensates for dimensional variation before and after manufacture of the arrester, and in which telescopically related electrical connections for the internal structure compensate for dimensional variations.

It will be understood that the embodiment of my invention heretofore described is exemplary of the principles involved and it is not to be as a limitation to interpretation of the claims, except where such interpretation goes beyond the scope of this invention.

I claim:

1. A lightning arrester comprising a lower housing section having a body of valve material therein, an upper housing section having a gap device therein electrically in series with said valve material, and electrically conductive means extending through the walls of said sections and connected with said material and device, said conductive means extending through the wall of

said upper housing including a sleeve-like compensating connection interiorly of the arrester adapted to compensate for dimensional variations in said sections and to maintain electrical connections under conditions resulting in such variations, the plane of juncture of said sections and areas of said sections through which said conductive means extend being sealed.

2. A lightning arrester comprising a lower housing section having a body of valve material therein, an upper housing section having a gap device therein electrically in series with said valve material, electrically conductive means extending through the walls of said sections and connected with said material and gap device, said conductive means extending through the wall of said upper housing including a sleeve-like compensating connection interiorly of the arrester adapted to compensate for dimensional variations in said sections and to maintain electrical connections under conditions resulting in such variations, and expansible pressure means coacting between said device and housing to maintain said gap device in pressure contact with said material, the plane of juncture of said sections and areas of said sections through which said conductive means extend being sealed.

3. A lightning arrester comprising a lower housing section having a valve material therein, an upper housing section having a gap device therein in series with said material and extending into said lower section, means securing said sections together, and a flash-over barrier integral with one of said sections and extending across the plane of juncture of said sections.

4. A lightning arrester comprising a lower housing section having a valve material therein, an upper housing section having a gap device therein in series with said material and extending into said lower section, means securing said sections together, and a flash-over barrier including a skirt integral with and extending from one of said sections into the other of said sections across the plane of juncture of said sections.

5. A lightning arrester comprising a lower housing section having a valve material therein, an upper housing section having a gap device therein in series with said material and extending into said lower section, said sections each having a peripheral flange adjacent the flange of the other of said sections, said flanges being beveled inwardly of said sections to provide a V groove exteriorly thereof, a resilient washer complementary to and disposed in said groove, a metal band surrounding said flanges and washer and having its margins spun over said flanges to secure said sections together, said washer being held under compression between said band and beveled portions of said flanges, and a flash-over barrier in said sections extending across the plane of juncture of said sections.

6. A lightning arrester comprising a lower housing section having a valve material therein, an upper housing section having a gap device therein in series with said material and extending into said lower section, said sections each having a peripheral flange adjacent the flange of the other of said sections, said flanges being beveled inwardly of said sections to provide a V groove exteriorly thereof, a resilient washer complementary to and disposed in said groove, a metal band surrounding said flanges and washer and having its margins spun over said flanges to secure said sections together, said washer being held under compression between said band and beveled portions of said flanges, and a flash-over barrier comprising a skirt integral with one of said sections extending across the plane of juncture of said sections and into said lower section.

7. A lightning arrester comprising a lower housing having an apertured bottom and a column of valve material therein with its upper end disposed a substantial distance below the upper end of said housing, an upper housing superimposed on the lower housing and having an apertured top and a gap device therein extending into the lower housing and contacting the upper end of said column, said upper housing having an annular skirt integral therewith and projecting into the lower housing toward said column, a metallic support engaged with the lower housing intermediate its ends, and electrically conductive means extending through said apertures and connected with said column and gap device, said apertures and plane of juncture of said housings being hermetically sealed.

8. In a lightning arrester, a pair of cup-like housings each having an apertured bottom and being in inverted relation to the other of said housings, valve material in one of said housings, a gap device in the other of said housings, and electrically conductive means extending through said apertures and connected with said material and gap device, the conductive means connected with said gap device including a telescopic connection, whereby dimensional variations in said housings are compensated.

9. In a lightning arrester, a pair of cup-like housings each having an apertured bottom and being in inverted relation to the other of said housings, valve material in one of said housings, a gap device in other of said housings contacting said material, electrically conductive means extending through said apertures and connected with said material and gap device, the conductive means connected with said gap device including a telescopic connection, whereby dimensional variations in said housings are compensated, and resilient means interposed between said gap device and upper housing holding said device in contact with said material.

10. In a lightning arrester, a pair of cup-like housings each having an apertured bottom and being in inverted relation to the other of said housings, valve material in one of said housings, a gap device in the other of said housings, said housings each having a peripheral flange adjacent the flange of the other of said housings, a sealing washer between said flanges, means engaging said flanges and washer, thereby holding said flanges in pressure engagement with said sealing washer, and electrically conductive means extending through said apertures and connected with said material and gap device, the conductive means connected with said gap device including electrically related slidable members, whereby dimensional variations in said housings are compensated.

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