Feb. 26, 1957 G. H. MANKE 2,783,410

LIGHTNING ARRESTERS

Filed Sept. 8, 1952

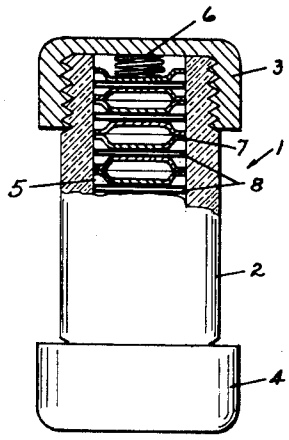


Fig. 1

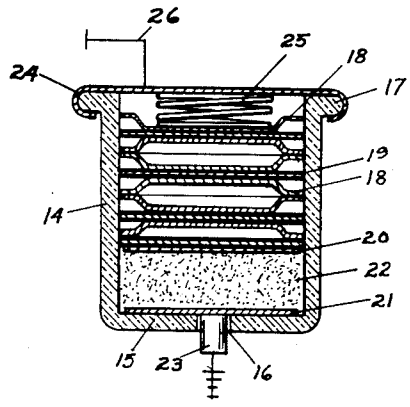


Fig. 2

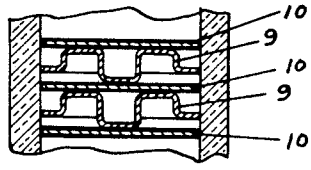


Fig 4

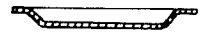


Fig. 3

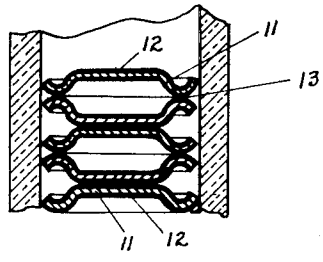


Fig. 5

INVENTOR.
George H Manke
BY
Attorney

United States Patent Office 2,783,410 Patented Feb. 26, 1957

2,783,410

LIGHTNING ARRESTERS

George H. Manke, South Milwaukee, Wis., assignor to McGraw Electric Company, Milwaukee, Wis., a corporation of Delaware

Application September 8, 1952, Serial No. 308,474

4 Claims. (Cl. 313—246)

This invention relates to a lightning arrester for protecting electric power circuits rated up to approximately 1000 volts, low voltage signal circuits and other communication circuits from insulation failure due to excessive voltage surges.

The object of this invention is to provide a spark gap using silicone coated conducting discs in series with conducting discs.

Another object of this invention is to provide a spark gap to be used on low voltage lines.

A further object of this invention is to provide in a spark gap a series of silicone coated formed conducting discs.

Other objects will appear from time to time in the course of specification and claims.

I illustrate several embodiments of this invention in the accompanying drawings in which:

Fig. 1 is a sectional view of a spark gap enclosing a series of silicone coated conducting discs and formed conducting discs.

Fig. 2 is a sectional view of a similar spark gap with valve material included.

Fig. 3 is a sectional view of a formed disc.

Fig. 4 is a fragmentary view of a variation of a formed disc.

Fig. 5 is a fragmentary view of another variation of a formed disc.

In spark gaps with a series of metal conductors within, a spark over is apt to cause a slight pitting of the metal. My invention takes advantage of this action on the metal. I use a silicone varnish and coat some or all of the conductors with it. The silicone varnish becomes an excellent insulator under the influence of an electric arc. The high temperature of the arc causes the silicone to decompose, leaving a highly resistive residue at the point of current flow.

When a lightning impulse passes through the spark gap, it punctures the silicone varnish. The silicone at the puncture point decomposes and in its decomposed state is able to interrupt the current flow. The puncture voltage depends upon the thickness of the silicone coating which can be increased or decreased to suit the requirements. Various voltage ratings are obtained by stacking various numbers of silicone coated discs in series.

When subsequent lightning impulses travel through the spark gap, they puncture the silicone in a different spot each time. This gives a good life expectancy to the spark gap.

In Fig. 1, I show a spark gap **1** consisting of a housing **2** with a cap **3** in threaded relation at the upper end of the housing **2** and a similar enclosure **4** in threaded relation at the lower end of the housing **2**.

A bore **5** extends through the interior of the housing and held in this bore by a spring means **6** is a series of formed discs **7** alternating with silicone coated conductor discs **8**. The formed discs **7** are shaped so that their edges will not touch the edge of the silicone coated discs. The

discs **7** are dish-shaped with a flange portion around the outer edge and when two discs are placed facing each other the flange portions are in contact. This removes the edge from the vicinity of the silicone coated discs so that the raw edges of the punched silicone coated discs will not make contact with adjacent discs. This forces the current to flow through a path punctured in the silicone coating.

There are various ways of shaping these formed discs. In Fig. 4, I show a manner of shaping the discs so that only one is necessary between the silicone coated discs. The discs **9** are formed in their mid portion to contact adjacent silicone coated discs **10** on both sides while the edges extend approximately midway between the adjacent discs **10**.

In Fig. 5, I coat modified dish-shaped discs **11** with a silicone coating **12** and place them in pairs facing each other. By forming the outer edge with an outward and inward curve, the contact point **13** is removed from the edge so that in case a raw metal edge protrudes through the silicone coat it will not make an electrical contact point between adjacent discs.

This spark gap can be used with or without valve material. The valve material freely conducts the surge current to ground and also offers high resistance to the power current which tends to follow the surge. This valve material is a chemically stable refractory crystalline material which combines marked valve action with high discharge capacity and permanence of characteristic. It is characterized by low impedance when subjected to very high potentials and high impedance when subjected to relatively low potentials, properties which render it very useful for lightning arrester service. The question of whether or not to use valve material and the quantity to use is determined by the extent of the follow current that is apt to occur.

In Fig. 2, I show my new spark gap with valve material. It consists of a circular glass housing **14** with a flat bottom **15** that has an opening **16** through its center area. The top of the glass housing **14** is open and a flange **17** surrounds this upper open edge. Within the housing **14** is a series of discs, two facing cup-shaped metal discs **18** alternating with silicone coated metal discs **19**. The cup-shaped discs **18** have raised and flanged edges forming a rim, said rims facing each other in close proximity while the dished portions of each pair of discs are spaced apart. It can be seen that this manner of facing the rims of each pair of discs provides edge clearance for the raw surfaces of the silicone coated discs **19**, and provides a contact space in the mid portion of the discs.

Below this series of discs two plain flat conductor discs **20** and **21**, spaced apart, hold the granular valve material **22** between them at the bottom of the glass housing **14**. The lower of these two discs, disc **21** has a ground terminal **23** attached to it. The ground terminal extends downwardly from the lower disc **21**, through the opening **16** in the housing.

The upper opening of the housing is enclosed by a copper cap **24** spun over the flange **17** of the housing **14**. Between this copper cap **24** and the top cup-shaped disc **18** within the housing is a spring **25** that serves to press the cup-shaped metal discs and the silicone coated discs in close proximity. A conductor line **26** connects the copper cap **24** with the line.

With this new device for carrying electrical impulses to the ground, I provide a simple construction that is inexpensive to make and serves adequately on low voltage lines. It puts to new use silicone coated metal, and the parts can be easily stamped from silicone coated sheet stock.

I claim:

1. A lightning arrester including a housing and closure means at both ends of the housing, a spark gap within said housing and comprising a plurality of alternately stacked discs, said stacked discs each having a depressed central portion and a radially disposed flange in contact relation to the flange of an adjacent alternate disc, substantially flat discs having a silicone varnish coating interposed between and in contact relation to said depressed portions, and a spring interposed between said closure means and said discs biasing said discs toward each other.

2. A lightning arrester including a housing and closure means at both ends of the housing, a spark gap within said housing and comprising a plurality of alternately stacked discs, each disc having silicone varnish coating and a depressed central portion in contact with the central portion of an adjacent disc through the medium of said silicone varnish and an arcuately flanged portion in contact with the flanged portion of an adjacent disc through the medium of said silicone varnish, and biasing means urging said discs toward each other.

3. A lightning arrester including a housing and closure means at both ends of the housing, a spark gap within said housing and comprising a plurality of stacked discs, certain of said discs having opposed depressions, other of said discs having a silicone varnish coating and being

interposed between said certain discs in contact with said depressions through the medium of said silicone varnish, and biasing means urging said stacked discs toward each other.

4. A lightning arrester including a housing and closure means at both ends thereof, a spark gap within the housing comprising a plurality of discs having central and adjacent portions depressed respectively to define contact surfaces lying in opposed planes on each side of a medium plane normal to the axis of each disc, said discs being stacked in adjacent axial alignment and including a silicone varnish coating contiguous with said contact surfaces and normally electrically insulating said discs from each other.

References Cited in the file of this patent

UNITED STATES PATENTS

1,238,660	Field-Frank	Aug. 26, 1917
1,723,872	Louge	Aug. 6, 1926
2,060,509	Krause	Nov. 10, 1936
2,173,625	Fujitaka	Sept. 19, 1939
2,264,700	Johnson et al.	Dec. 2, 1941

FOREIGN PATENTS

605,793	Great Britain	July 30, 1948