Dec. 1, 1953 H. O. STOELTING 2,661,439

LIGHTNING ARRESTER

Filed July 31, 1950

Fig. 1

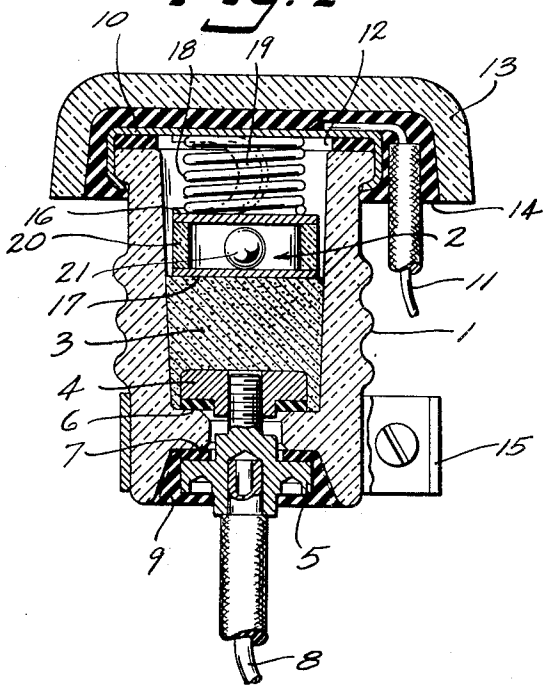


Fig. 2

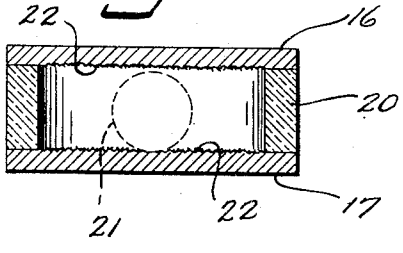
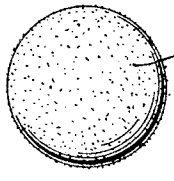


Fig. 3



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LIGHTNING ARRESTER

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1 Claim. (Cl. 313—146)

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This invention relates to lightning arresters and is particularly directed to a low voltage lightning arrester.

In previous experiments in lightning arresters, various attempts have been made to provide electrodes at the spark gap for the low voltage lightning arresters which would break down at a relatively low impulse voltage. Sandblasting has been used with an object of roughening the electrodes, but it has been found that the sandblasting does not produce sharp minute multitudinous points on the electrodes. Instead the sand breaks up as it strikes the electrodes and forms rounded protuberances instead of sharp projections.

This invention is intended to overcome the above noted defects and objects of this invention are to provide a novel form of low voltage lightning arrester and novel forms of electrodes therefor, together with a novel method of producing the electrodes.

In greater detail, objects of this invention are to provide a low voltage lightning arrester which has a low impulse voltage break down, but which maintains a proper and predetermined voltage break down for the ordinary frequencies employed in distribution systems.

Further objects are to provide a lightning arrester in which the spark gap, which is arranged in series with valve material in accordance with the usual practice, is provided with opposed electrodes which have a multitude of minute sharp projections so as to greatly reduce the impulse voltage break down of the lightning arrester, but which maintains a proper and predetermined voltage break down for the commercial frequencies.

A further object is to provide a low voltage lightning arrester which does not produce radio disturbances up to substantially spark-over.

Further objects are to provide novel forms of electrodes for low voltage lightning arresters in which the electrodes are so formed that their surface has a multitude of substantially uniformly formed, closely spaced sharp projecting points.

A further object of this invention is to provide a novel method of making the electrodes in which chilled steel "grit" is projected by means of a stream of air against the surface of the finished electrodes to form a multitude of very fine and very sharp points on the finished surface of the electrodes.

Embodiments of the invention are shown in the accompanying drawings, in which—

Figure 1 is a sectional view through a low voltage lightning arrester.

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Figure 2 is an enlarged sectional detail of the spark gap assembly.

Figure 3 shows the metal ball removed from the spark gap assembly.

Referring to the drawings, it will be seen that the lightning arrester comprises a ceramic tubular body portion 1 within which is housed the spark gap assembly indicated generally by the reference character 2 and the valve material 3 in series therewith. The lower electrode of the lightning arrester is indicated by the reference character 4 and is screw threaded to the lower metal terminal portion 5, suitable gaskets 6 and 7 being clamped in place as shown in Figure 1. The ground conductor indicated at 8 is soldered or otherwise secured to the lower terminal 5 and the space surrounding the lower terminal is filled with cement, such as asphalt or other suitable material, as indicated by the reference character 9.

The upper terminal consists of a metal cap 10 which is spun, crimped, or otherwise secured to the upper flange of the body portion 1 and has soldered or brazed thereto the conductor 11 adapted to be connected to the line. A gasket 12 is interposed between the metal cap 10 and the body portion 1 of the lightning arrester.

A ceramic cap 13 is positioned on the top portion of the lightning arrester and is secured thereto by means of asphalt or other cement 14.

The lightning arrester may be held in any suitable manner as by means of a clamp 15 adapted to be attached to a suitable support.

The spark gap assembly 2 consists of an upper and a lower electrode 16 and 17, respectively, the upper electrode being pressed downwardly by means of a helical compression spring 18 and being connected to the upper metal cap 10 by means of a flat spring-like conductor 19. An annular spacer, preferably of ceramic material indicated by the reference character 20 is positioned between the upper and lower electrodes 16 and 17. A metal ball 21 is loosely positioned between the electrodes 16 and 17 and rests upon the lower electrode and is spaced a slight distance from the upper electrode.

The detail of the surface of the upper and lower electrodes is shown in the enlarged view, Figure 2. It will be noted that these surfaces have a plurality of minute points 22 formed integral therewith and projecting therefrom. These points are formed by blasting the finished surfaces of the electrodes with a chilled steel "grit" of fine size such, for example, as that which will pass through a forty mesh screen.

If desired, the ball 21 may be a plain ball with a polished surface or it may be a ball in which

the finished surface has been blasted by the forty mesh chilled steel "grit" so that the minute projections are formed as an integral part of the surface of the ball and project a very small distance outwardly therefrom. This last described form of the invention is shown in Figure 3 and the ball is indicated by the reference character 21'.

It has been found that the lightning arrester constructed in accordance with this invention has a more consistent break-down voltage for a surge and yet maintains a predetermined proper break-down voltage at ordinary commercial frequencies so that it will not break down under normal voltage conditions.

It has been found also that the electrodes may be very quickly and easily prepared by blasting them with the forty mesh chilled steel "grit" to form sharp projections on the surface of the electrodes.

Further, it is to be noted that the ball is freely movable and can adjust itself after each discharge as it is readily moved by even a minute force applied thereto through jarring or through any magnetic reaction that may result due to a large current flow during discharge. The points produced by the blasting with the forty mesh chilled steel grit are sufficiently small to allow the ball to freely roll on the lower electrode.

It has been found that the multiplicity of sharp projections on the electrodes condition the atmosphere of the spark gap so that constant spark-over values are obtained. A well supported theory as to this phenomena is that X-ray emanations partially ionize the atmosphere at a voltage above operating voltage. It has been found from actual tests that there is no radio interference before spark-over has been reached.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

A lightning arrester spark gap assembly having upper and lower opposed electrodes each having a face provided with a multitude of minute, sharp points projecting from said face and formed integral therewith, and a metal ball located between said electrodes and having a diameter less than the space between said electrodes, said metal ball having a multitude of minute, sharp points projecting from the surface of said ball, said lower electrode supporting said ball and said ball being free to roll on said lower electrode, the sharp points of the ball and the lower electrode being of a size to permit free rolling of said ball on said lower electrode.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,561,249	Kraut	Nov. 10, 1925
1,658,746	Steinmetz	Feb. 7, 1928
1,682,476	Breisch	Aug. 28, 1928
1,774,874	Eatherton	Sept. 2, 1930
2,180,988	Lemmers	Nov. 21, 1939
2,214,974	Scott	Sept. 17, 1940
2,290,526	Berkey	July 21, 1942
2,305,398	Watson	Dec. 15, 1942
2,328,869	Wilkie	Sept. 7, 1943
2,519,445	Drieschman	Aug. 22, 1950