Jan. 30, 1951 R. D. NELSON 2,539,749

OPEN TYPE VALVE ARRESTER

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Fig. 1.

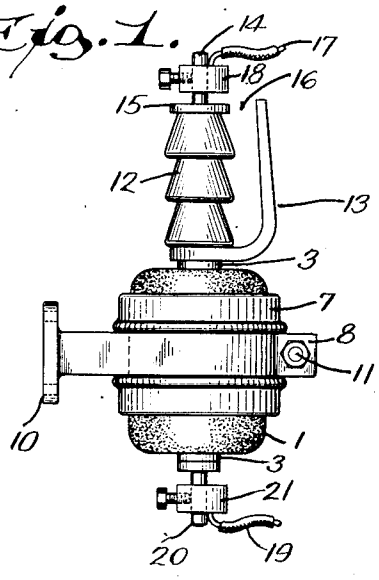


Fig. 2.

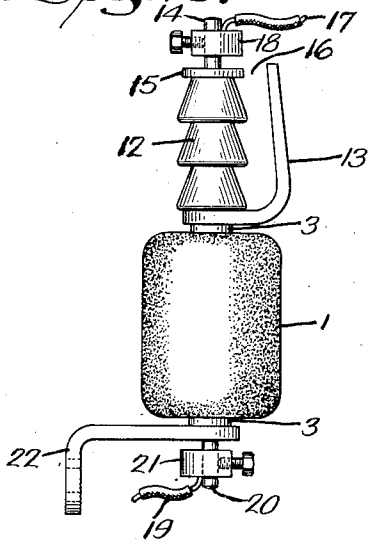


Fig. 3.

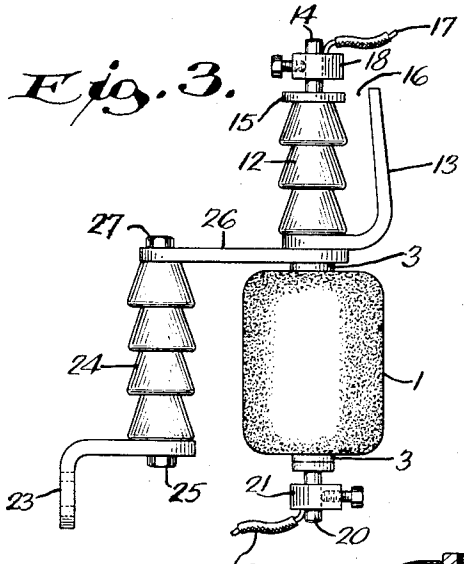


Fig. 4.

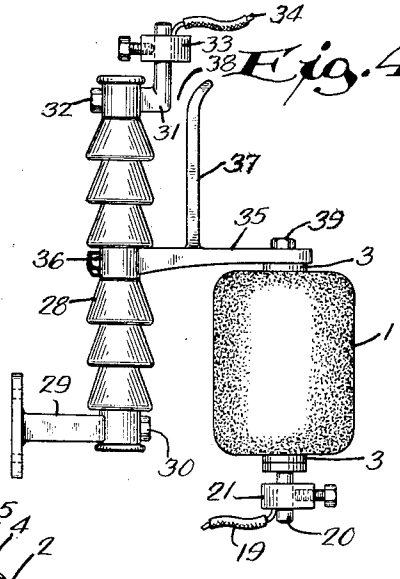
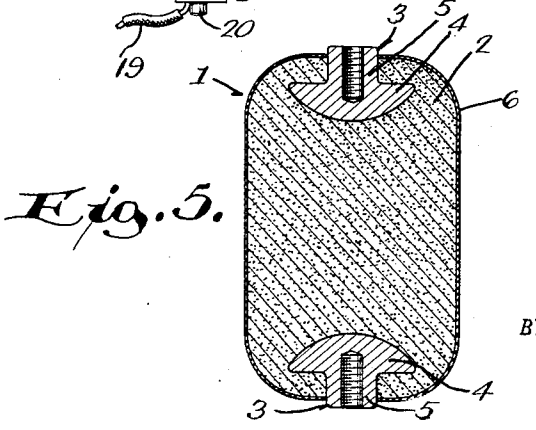


Fig. 5.



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OPEN TYPE VALVE ARRESTER

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2 Claims. (Cl. 175—30)

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This invention relates to improvements in lightning arresters.

More particularly, this invention is directed to the so-called valve type arrester which embodies a solid molded current limiting element in series relation to a spark-over gap.

Arresters in common use embody an insulating housing, enclosing a valve element and spark-over gap, which is preferably sealed against the entrance of moisture. Failure of the valve element to function properly renders the entire device useless and necessitates the substitution of a completely new arrester.

An object of this invention is to provide an arrester in which damaged portions thereof may be replaced without discarding other portions of the arrester combination.

More particularly it is an object to provide an arrester comprising an insulating support, a spark-over gap, and a solid, molded valve element, each of which may be replaced independently of the other, and in which the valve element may serve as a disconnecting device upon its failure to limit the flow of follow current after the occurrence of a surge discharge.

Arresters enclosed in insulating housings which are improperly sealed, collect moisture interiorly thereof with the result that, under varying ambient temperatures, conditions of high humidity of the air within the housings may prevail and permit corona discharges that cause radio interference and also aid in corroding the surfaces of the gap electrodes. Even the valve or resistance material may be affected if it has any tendency to absorb moisture.

Accordingly, it is another object of this invention to provide an arrester in which the humidity of the air surrounding the air gap electrodes and the valve or resistance material will always be substantially the same as that prevailing in the locality where the arrester is situated. Even though the arrester of my invention may, under certain weather conditions, tend to collect moisture, any leakage of current by reason of the presence of the moisture, will drive the moisture off and restore the arrester subject to normal conditions approximating those prevailing in the vicinity, thus eliminating conditions which may allow corona discharges and resultant radio interference.

In the drawings:

Fig. 1 is a view in side elevation of one modification of my invention.

Fig. 2 is a view in side elevation of another modification of my invention.

Fig. 3 is a side view of a third modification.

Fig. 4 is also a side view of further modified form of my invention.

Fig. 5 is a sectional view taken on the vertical

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axis of the valve element shown in Figs. 1 through 4, inclusive.

The valve element 1 comprises a cylindrical block 2 of molded composition including granules of silicon carbide and sodium silicate or other binding material. As indicated in Fig. 5, the element 1 is provided at each end with an electrode 3 which has a head portion 4 embedded in the composition and an internally threaded shank 5 projecting from the block.

The block 2 is completely encased by a film of insulating material 6, such as silicone resin, acting as a moisture excluding seal and insulation, preventing flashover exteriorly of the block.

When the sodium silicate is used as a binder for the silicon carbide granules, the molded block is first thoroughly baked to drive off excess moisture. Thereafter, the block is coated with a silicone resin and baked again at approximately 250° C.

As indicated, the head portion 4 of each electrode is spherically contoured toward the other. This disposes the shortest distance between the electrodes substantially on the axis of the valve element 1 and minimizes the chances of flashover occurring along the periphery of the valve element.

An alternative construction of the valve element may comprise silicon carbide and a binder of silicone resin or clay.

As shown in Fig. 1, the block 2 is encased in a ceramic cylinder 7 embraced by a pair of clamping arms 8 (one of which is not shown) extending from the bracket base 10. The arms 8 are held in clamping relation to the cylinder 7 by means of a bolt and nut assembly 11.

Mounted on the upper end of the block in Figs. 1 and 2 is an insulator 12 and an arcing electrode 13 extending upwardly in parallelism with the insulator and horizontally beneath the insulator in contact with the electrode 3 on the upper end of the block 2. The upper end of the insulator 12 is provided with a terminal post 14 having an arcing flange 15 adjacent the upper end of the electrode 13 to provide an arc gap 16. The post 14 is connected to a line conductor 17 by means of a clamp 18.

To secure the insulator 12 and electrode 13 to the valve block 2, the insulator is provided with a threaded stud (not shown) extending through the horizontal portion of the electrode and socketed in the electrode 3 at the upper end of the block.

In Figs. 1, 3 and 4, the lower end of the valve block 2 is connected to a grounded conductor 19 by means of a terminal post 20, which is threaded into the electrode 3 at the lower end of the block, and a clamp 21 securing the conductor to the post.

In Fig. 2, the block 2 is mounted on an angle bracket 22 and is secured thereto by means of the post 20 which is grounded through the grounded conductor 19 and clamp 21.

In the Fig. 3 modification the gap and valve assembly is mounted on an insulating support comprising an angle bracket 23, an insulator 24 secured thereto by bolt 25 and a horizontal bar 26 secured to the upper end of the insulator 24 by a bolt 27. The horizontal bar 26 is clamped between the base of the electrode 13 and the electrode 3 on the upper end of the block 2.

In the modification shown in Fig. 4, a one piece insulator 28 is secured to a bracket 29 at its lower end by bolt 30 and is provided at its upper end with an angle terminal post 31 secured to the insulator by a bolt 32. A clamp 33 secures a line conductor 34 to the post. Intermediate the ends of the insulator 28 is a horizontal conductive bar 35 secured thereto by bolt 36 and provided with an upright electrode finger 37 terminating adjacent the post 31 to provide a flashover gap 38. The end of the bar 35 remote from the insulator 28 is secured to the electrode 3 on the upper end of the valve block 1 by a bolt 39.

As a protective device for high-tension electric lines, the lightning arrester in each modified assembly is designed to discharge abnormal surges to ground and avoid damage to other apparatus in the line. When a surge occurs in the line at a value above the rated voltage of the arrester, a sparkover occurs in the gap, 16 in Figs. 1, 2 and 3 and 38 in Fig. 4, and power current follows through and passes to ground through the valve element 1. It is the function of the valve element to offer a relatively low resistance to the flow of the surge current to ground and a relatively high resistance to the flow of power current to ground. Thus, when the abnormal voltage in the line is dissipated through the arrester, the valve element reduces the flow of power current through the valve element to a value which enables the gap to cut off the flow and restore the line to normal operating conditions.

As previously stated, it is common practice to enclose the gap and valve element in an insulating housing. Consequently, upon failure of the valve element to function properly, the entire assembly is destroyed or seriously damaged by excessive flow of power current, with the result that an entirely new assembly must be substituted. This fact makes the necessary maintenance cost for protective devices in the art to which this invention relates much higher than desired.

Although the enclosed type arrester is expensive to replace, it does have the advantage of a unit assembly that is easily handled and installed.

The invention disclosed herein has the advantage of unit assembly and the efficiency of prior art arresters, but in contrast to prior art arresters, may be repaired by the substitution of new parts for damaged parts without discarding other parts thereof. It also has the advantage of cheaper manufacturing costs.

As an illustration of the adaptability of the arrester herein disclosed to repair after damage, assume that the valve element has broken down under severe discharge conditions, then the damaged element may be removed and a new one substituted in a manner obvious from the foregoing disclosure. Likewise, any of the component parts of the combinations herein disclosed may be removed when damaged and replaced by one which will function satisfactorily.

A feature of the Figs. 3 and 4 modifications resides in the fact that, upon failure of the valve element to perform its function following a surge discharge, the element may be ruptured and drop from the support thus severing the ground connection and introducing a gap of a length sufficient to insure that a fault will not reoccur through the damaged valve element when the line has been restored to normal operating condition.

A result will be secured in the Fig. 2 modification similar to that secured in the Figs. 3 and 4 modifications, but with this difference, namely, when the valve element is ruptured it will drop from the bracket and be suspended from the live conductor 17.

Either one of two or both actions may follow upon damage of the valve element in the Fig. 1 modification. Rupture of the element may occur at the upper end and permit the insulator and its associated electrode 13 to drop and be suspended from the live conductor 17 or the rupture may occur at the lower end and permit the ground wire to drop from the arrester. It is possible that both events may occur substantially simultaneously under severe conditions.

I claim:

1. A lightning arrester comprising in combination, an insulating support including a mounting bracket, insulator means thereon, a terminal mounted on said insulator means and spaced from said bracket in insulated relation thereto, and a solid valve element having a pair of spaced electrodes, one of said electrodes being secured to a portion of said insulator means intermediate and insulated from said bracket and terminal, said one of said electrodes including a gap terminal forming a spark-over gap with the first mentioned terminal, and said valve element having free air exposure except at its ends and being readily rupturable in the presence of abnormal surge discharge to break ground connection.

2. A lightning arrester comprising in combination, an insulating support including a mounting bracket, insulator means thereon, a terminal mounted on said insulator means and spaced from said bracket in insulated relation thereto, and a solid valve element having a pair of spaced electrodes, one of said electrodes being secured to a portion of said insulator means intermediate and insulated from said bracket and terminal, said one of said electrodes including a gap terminal forming a spark-over gap with the first mentioned terminal, and said valve element having free air exposure except at its ends and being suspended by said last named electrode and readily rupturable in the presence of abnormal surge discharge to break ground connection.

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