

Overvoltage Arrester

The present invention relates to an overvoltage arrester
5 with a gas-filled ceramic insulator, with two electrodes
inserted into the ceramic insulator subject to a mutual
spacing, between which an electrically conductive
connection is formed in the event of overvoltage conditions
occurring, and with a short-circuiting element that is
10 provided on the outside of the ceramic insulator for the
purpose of establishing a galvanic connection between the
two electrodes in the event of a temperature of the
overvoltage arrester being exceeded that is critical for
the environment, said short-circuiting element being
15 conductively connected to one electrode and connected to
the other via an insulating fusion pyrometer.

The principal object of such generally known overvoltage
arresters consists in protecting electrical appliances,
20 devices or installations against overvoltages arising as a
result of being struck by lightning, making contact with a
high-voltage transmission line or the like. The
overvoltage arresters consist in principle of a gas-filled
spark gap in which, in a gas-tight insulated housing, at
25 least two electrodes are located opposite one another
subject to a small spacing which in the normal case isolate
electrically conductive parts of the installation. In the
event of overvoltages occurring, a gas discharge takes
place between the electrodes, as a result of which the
30 voltage applied to the protected installation is lowered to
the sustaining voltage of the gas discharge.

If the overvoltage conditions persist for a fairly long
time and a current flows continuously through the spark
35 gap, it may happen that the overvoltage arrester becomes so

intensely heated that, on the one hand, it is destroyed and can no longer perform its function, which would lead to destruction of the installation to be protected, and that, on the other hand, as a result of the intense heating there is a risk of fire for the environment. With a view to avoiding these risks, use is made of so-called "fail-safe" or "thermoprotection" devices which in the event of such overloads occurring establish a short-circuit between the electrodes via a suitable short-circuiting element. This prevents the overvoltage arrester from being heated any further.

In the case of an overvoltage arrester of the type stated at the outset that is described in EP-A-0 548 587 the short-circuiting element is formed by a spring contact which is attached onto one electrode and which is guided to the other electrode via the ceramic insulator and is held by the insulating fusion pyrometer at a spacing from said other electrode. By virtue of the short-circuiting element encompassing the other electrode from outside, this construction of the thermoprotection device results in a certain increase in the height of the overvoltage arrester, which is particularly undesirable for those overvoltage arresters which are provided for the assembly of a magazine. For not only are these magazines becoming ever smaller and require corresponding miniaturisation of the overvoltage arresters, but also a sufficiently large safety margin has to be maintained in relation to the neighbouring compartments of the magazine. This latter point means that these known overvoltage arresters have to be positioned in the magazine compartments in such a way that a possible short-circuit is unable to interfere with adjacent overvoltage arresters. And this requirement increases the costs of assembling the magazines.

By virtue of the invention an overvoltage arrester of the type stated at the outset is now to be specified having a form that is as compact as possible, whereby no attention needs to be paid to a particular location or placement of the overvoltage arrester when it is incorporated into a magazine.

According to the invention this object is achieved in that the ceramic insulator comprises at least one contact region conductively connected to an electrode and in that the insulating fusion pyrometer abuts the said contact region.

The construction in accordance with the invention of the overvoltage arrester has the advantage that the short-circuiting element only has to extend into proximity with the other electrode and does not, as hitherto, have to protrude beyond the latter. As a result, the location of a possible short-circuit is shifted inward from the edge of the overvoltage arrester, so that the occurrence of a short-circuit with adjacent contact parts is prevented. In addition, by virtue of its compact structural design the overvoltage arrester according to the invention can be used universally.

A first preferred embodiment of the overvoltage arrester according to the invention is characterised in that the ceramic insulator comprises a contact region at both ends and in that the insulating fusion pyrometer abuts the contact region connected to the other electrode.

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Despite the application of two metallised regions, this symmetrical construction of the ceramic insulator results in a lowering of the manufacturing costs, since in the course of fitting the short-circuiting element no care needs to be taken to ensure that the latter is attached to

the correct electrode - ie, the electrode located opposite the contact region.

A second preferred embodiment of the overvoltage arrester according to the invention is characterised in that the diameter of the ceramic insulator is smaller than the diameter of the electrodes and in that the fusion pyrometer is of such dimensions that it projects at most slightly beyond the electrodes.

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This embodiment has the advantage that the short-circuiting element practically no longer juts out laterally from the overvoltage arrester and does not impair the compactness of the overvoltage arrester.

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A third preferred embodiment of the overvoltage arrester according to the invention is characterised in that the contact region or regions is/are formed by a uniform metallised layer covering the respective front side and the adjoining edge zone of the outer face of the ceramic insulator.

This embodiment has the advantage that the requisite metallisation for soldering the electrodes onto the ceramic insulator and the contact regions on the outer face of the ceramic insulator can be applied in one working procedure. In addition, the electrical conductivity is optimised by the uninterrupted metallisation.

In the following the invention is elucidated in more detail on the basis of embodiment examples and the drawings; illustrated are:

Fig. 1 a front view of a two-pole overvoltage arrester;

Fig. 2 a view in the direction of arrow II of Fig. 1;

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and

Fig. 3 a front view of a three-pole overvoltage arrester.

The two-pole overvoltage arrester 1 represented in Figs. 1 and 2 consists of a tubular ceramic insulator 2, the two ends of which are sealed by two metal electrodes 3, 4 in gas-tight manner by means of high-temperature soldering. The gas-discharge chamber that is formed as a result is filled with a noble gas such as argon or neon, for example. On a front side of the ceramic insulator 2 a short-circuiting element 5 is provided which serves to establish a galvanic connection between the two metal electrodes 3, 4 in the event of overloading of the overvoltage arrester 1.

The short-circuiting element 5 consists, as shown, of a spring 6 made of copper-beryllium or another suitable material, one end of which is connected to the electrode 4, being preferably welded onto the latter, and the other end of which bears an insulating fusion pyrometer 7 made of polypropylene and presses the latter from outside towards the ceramic insulator 2 in the region in front of the electrode 3. The ceramic insulator 2 is provided at each of its ends with a contact region, 8 and 9 respectively, that is conductively connected to the respective electrode 3, 4 and is marked in the Figures by cross-hatching, whereby the insulating fusion pyrometer 7 abuts the contact region 8 that is connected to the electrode 3. The contact regions 8, 9 are formed by a metallised layer covering the respective front side and the adjoining edge zone of the outer face of the ceramic insulator 2. The metallised layer consists of an outer layer of nickel and an inner layer with a view to establishing a lasting connection between the nickel layer and the ceramic insulator 2. The inner layer is preferably formed by a molybdenum-manganese connection or by another suitable material or a suitable alloy.

The overvoltage arrester 1 operates in such a way that in the normal case there is no electrical connection between the electrodes 3 and 4. In the event of overvoltage conditions occurring, a gas discharge takes place between the electrodes 3 and 4 in the gas-discharge chamber inside the ceramic insulator 2, as a result of which the overvoltage is reduced to a level that is safe for the installation to be protected. If the overvoltage conditions last for a fairly long time, the overvoltage arrester 2 becomes so intensely heated that the insulating fusion pyrometer 7 softens and the spring 6 comes into conductive contact with the contact region 8 and the electrodes 3 and 4 are galvanically connected.

15 The contact regions 8, 9 offer the advantage that, with a view to securely establishing the conductive connection between the two electrodes 3 and 4, the spring 6 can be kept shorter than hitherto and no longer needs to contact the electrode 3 directly. As a result, the location of a possible short-circuit between spring 6 and electrode 3 is shifted inward from the outer edge of the overvoltage arrester 1 and therefore is spaced further from adjacent overvoltage arresters arranged within a magazine.

25 Of course, from the point of view of function only the contact region 8 for the electrode 3 would be required, so it would be possible to dispense with the contact region 9 for the electrode 4. But it has become evident that the costs brought about by the application of two contact regions are significantly less than the costs that would arise in the case of an overvoltage arrester with only one contact region, through having to pay attention in the course of assembly to the correspondence between the electrode 4 bearing the spring 6 and the one contact region

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The three-pole overvoltage arrester 10 represented in Fig. 3 consists of a central electrode 11, two outer electrodes 12, two ceramic insulators 2 with contact regions 8 and 9 and a short-circuiting element 13 which serves to establish a galvanic connection between the outer electrodes 12 and the central electrode 11. The short-circuiting element 13 consists of a spring 6' which is welded to the central electrode 11, the two ends of said spring each bearing an insulating fusion pyrometer 7, each of which abuts the contact region 8 that is conductively connected to the associated outer electrode 12. The materials of the electrodes 11 and 12, of the spring 6' and of the insulating fusion pyrometers 7 are the same as in the case of the two-pole overvoltage arrester 1 represented in Figs. 1 and 2. Likewise, that which was said with regard to the two-pole overvoltage arrester 1 applies with respect to the contact regions 8 and 9.

As shown, the diameter of the ceramic insulators 2 is smaller than the diameter of the electrodes 11 and 12, so that the insulating fusion pyrometers 7 project at most slightly beyond the edges of the electrodes. As a result, the short-circuiting element 13 abuts the ceramic insulators 2 very closely and practically does not impair the compactness of the overvoltage arrester 10.

Of course, also in the case of the two-pole overvoltage arrester 1 represented in Figures 1 and 2 it is advantageous if the diameter of the ceramic insulator 2 is smaller than that of the electrodes 3 and 4 and if the insulating fusion pyrometer 7 projects at most slightly beyond the electrodes.



1. Overvoltage arrester with a gas-filled ceramic insulator (2), with two electrodes (3, 4; 11, 12) inserted
5 into the ceramic insulator (2) subject to a mutual spacing, between which an electrically conductive connection is formed in the event of overvoltage conditions occurring, and with a short-circuiting element (5, 13) that is provided on the outside of the ceramic insulator (2) for
10 the purpose of establishing a galvanic connection between the two electrodes (3, 4; 11, 12) in the event of a temperature of the overvoltage arrester (1, 10) being exceeded that is critical for the environment, said short-circuiting element being conductively connected to one
15 electrode (4, 11) and connected to the other (3, 12) via an insulating fusion pyrometer (7), characterised in that the ceramic insulator (2) comprises at least one contact region (8) conductively connected to an electrode (3, 12) and in that the insulating fusion pyrometer (7) abuts this contact
20 region.

2. Overvoltage arrester according to Claim 1, characterised in that the ceramic insulator (2) comprises a contact region (8, 9) at both ends and in that the
25 insulating fusion pyrometer (7) abuts the contact region (8) connected to the other electrode (3, 12).

3. Overvoltage arrester according to Claim 1 or 2, characterised in that the contact region (8) or the contact
30 regions (8, 9) is/are formed by a uniform metallised layer covering the respective front side and the adjoining edge zone of the outer face of the ceramic insulator (2).

4. Overvoltage arrester according to Claim 3,
35 characterised in that the electrodes (3, 4; 11, 12) are connected to the ceramic insulator (2) by high-temperature



soldering and in that the metallised layer (8) on the one hand has the requisite electrical conductivity and current-carrying capacity and on the other hand serves as a connection for the soldered layer.

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5. Overvoltage arrester according to Claim 4, characterised in that the metallised layer consists of an electrically conductive material, preferably a metal or an alloy.

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6. Overvoltage arrester according to Claim 4, characterised by a sublayer arranged between the ceramic insulator (2) and the metallised layer with a view to improving the adhesion of the metallised layer on the ceramic insulator (2).

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7. Overvoltage arrester according to Claim 6, characterised in that the sublayer consists of molybdenum-manganese.

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8. Overvoltage arrester according to one of Claims 3 to 7, characterised in that the metallised layer (8), the electrodes (3, 4; 11, 12) and the short-circuiting element (5, 13) are made corrosion-resistant, being preferably tin-plated.

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