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Lange

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[54] **OVERVOLTAGE ARRESTER**

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[30] **Foreign Application Priority Data**

Jan. 13, 1971 Germany ..... P 21 01 417.5

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[51] **Int. Cl.** **H02h 9/06**

[58] **Field of Search** 313/217; 317/61, 317/61.5, 62, 69, 70

[56] **References Cited**

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[57] **ABSTRACT**

An overvoltage arrester having a pair of electrodes received in a gas tight housing with the electrode surfaces arranged in a spaced, facing relationship characterized by at least one of the electrode surfaces of the pair of electrodes being coated with a small metal sheet which has a diameter greater than the diameter of the electrode surface. In an embodiment of the invention, the metal sheet has a dish-shaped recess at its center and is connected to the surface of the electrode at the dish-shaped recess so that the peripheral edge of the sheet is spaced from the surface of the electrode and the opposite electrode.

4 Claims, 3 Drawing Figures

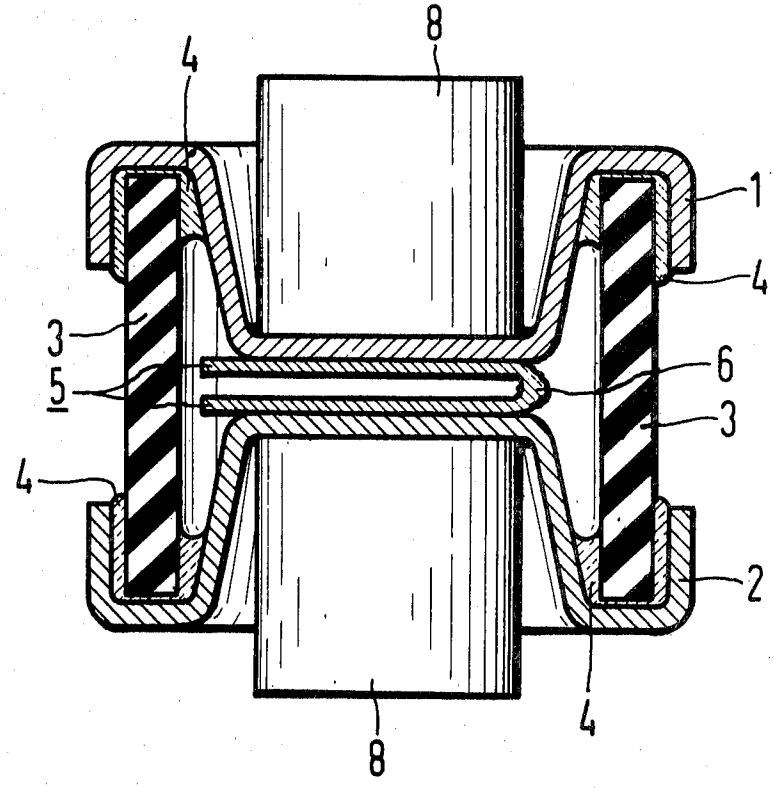


Fig. 1

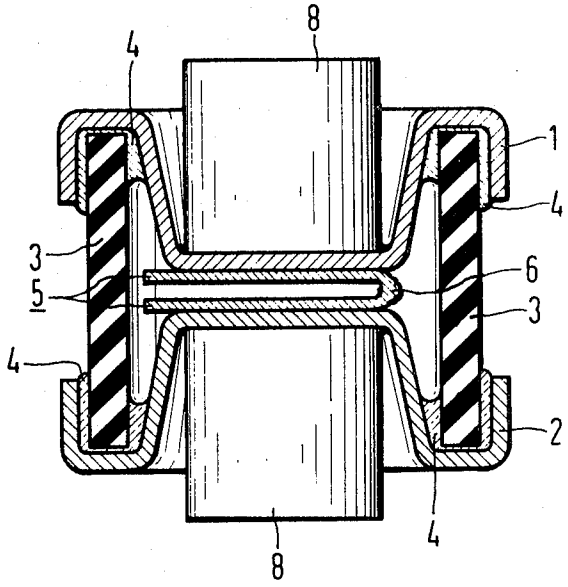


Fig. 2

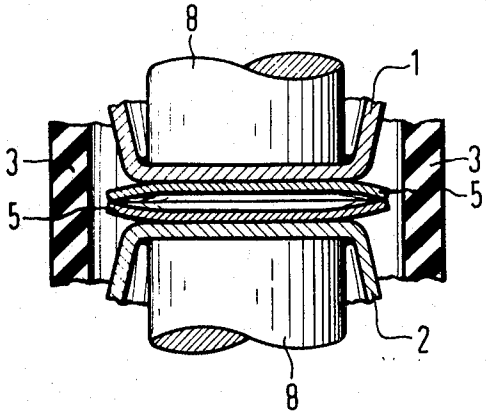
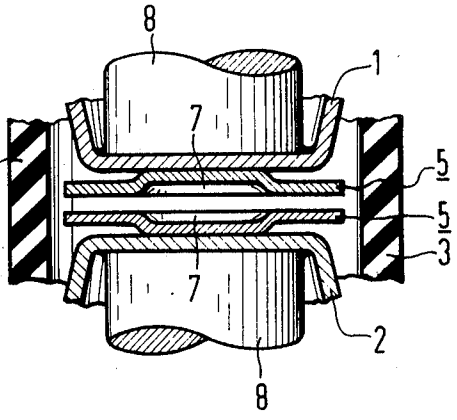


Fig. 3



OVERVOLTAGE ARRESTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed to an overvoltage arrester having means forming an internal short circuit in the event that the arrester is subjected to an overload voltage.

2. Prior Art

An overvoltage arrester having a pair of electrodes with the electrode faces or surfaces arranged in spaced, facing relationship and at least one electrode surface of the pair having a coating comprising a thin metal sheet or foil pressed onto the electrode to conform with the electrode surface and welded at one point to the electrode surface is known. In such an arrester, a voltage overload causes overheating of the foil adjacent to the welding point of the metal foil so that the foil will either bend away from the electrode surface into contact with the surface of the other electrode or melt and cause a short circuit therebetween. In such an arrester, the metal foil applied to the electrode is directly exposed to the discharge current and the heating of the metal foil during the application of an overload voltage to the arrester is thus directly proportional to the electrical energy which is discharged through the arrester. In such an arrangement, the short circuit characteristic for the arrester, which characterization is the current time characteristic for which an electrical power can be dissipated for a given period of time until the arrester transfers to a continuous short circuit, can be selected to be below the destruction characteristic of the device, which destruction characteristic is the current-time characteristic, which is analogous to the characteristic of a short circuit characteristic, for the amount of voltage which can be applied for a certain time period to the arrester to cause destruction of the arrester.

SUMMARY OF THE INVENTION

The present invention is directed to an improvement for an overvoltage arrester in which a pair of electrodes are arranged in a gas tight housing with the electrode surfaces in spaced and facing relationship with at least one of the electrode surfaces having a thin sheet of metal attached to the surface which sheet of metal has a diameter greater than the diameter of the electrode surface so that the marginal or peripheral edges of the sheet do not rest on the electrode surface. During the application of an overload voltage to the arrester, if the metal sheet is very thin the marginal edges will bend to form an electrical contact and short circuit with the other electrode or if the metal sheet is thicker, the edges will melt to form a short circuit between the electrodes. Preferably, the thin sheet metal member is applied to each of the electrode surfaces of the pair of electrodes In one embodiment of the invention to improve the short circuit characteristics of the arrester the single thin metal sheet or both sheets have a dish-shaped recess at the center of the sheet and are attached to their respective electrodes at the recess with the marginal edge of each sheet being in spaced relationship to both electrodes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross sectional view of an embodiment of an overvoltage arrester according to the present invention and illustrates a high short circuit characteristic of the arrester;

FIG. 2 is a partial cross sectional view of the overvoltage arrester according to the present invention as illustrated in FIG. 1 illustrating a relative low short circuit characteristic of the device; and

FIG. 3 is a cross sectional view of another embodiment of the overvoltage arrester according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The principles of the present invention are particularly useful in an overvoltage arrester such as illustrated in FIG. 1, which is a so-called knob arrester that consists essentially of two frustrum shaped electrodes 1 and 2 which are inserted in the ends of a tubular insulator member 3 with the electrode surfaces facing each other in a desired space relationship. Each of the electrodes 1 and 2 is provided with an outer terminal 8 which is in the form of a massive metal rod. The insulator member 3 is advantageously made of a ceramic material which is connected to each of the electrodes 1 and 2 by a gas tight connection 4 preferably by a metal to glass ceramic connection utilizing the application of glass, however prior art solder connections maybe used to form the connection 4. Due to connections 4, the insulating member 3 and the electrodes 1 and 2 form a gas tight envelope or housing.

At least one of the facing electrode surfaces of the pair of electrodes 1 and 2 and preferably both electrode surfaces are coated with an arc resistant, thin metal sheet 5 which has a diameter greater than the diameter of the electrode surface so that a marginal edge extends outwardly therefrom and does not overlie the electrode surfaces. The metal sheet, which is preferably iron, is firmly connected with an electrical connection preferably by copper soldering to its respective electrode surface.

As illustrated in FIG. 1, the thin marginal edges of the sheet 5 which do not rest on the electrode surface, have a different rate for dissipating heat than the portions of the sheet 5 which are in contact with the electrode surface. When a voltage overload is applied to the arrester by one of the terminals or connectors 8, the metal sheet 5 will be heated and due to the different rate of heat dissipation for edge portions and center portions, the marginal or peripheral edges heats up and either melts to form a short circuit 6 between the sheets 5 or a sheet 5 and the other electrode (FIG. 1) or due to thermal stress bends away from the electrode surface to form the short circuit illustrated in FIG. 2.

By selecting the composition of the material of the metal sheets 5, by selecting the thickness of the metal sheets 5, and by selecting the size of the heat conductive surface connecting the metal sheets 5 with the electrode surface, the short circuit characteristic for the arrester can be adjusted. If the sheet 5 is very thin, it will bend when overheated to form the short circuit. If the sheet 5 is thicker and resistant to bending, then the short circuit is formed by the melting of the sheet as illustrated in FIG. 1. By adjusting the material and the dimensions of the sheet 5 a short circuit character-

istic can be selected that always remains below the destruction characteristic for the arrester and provides protection for a range of over voltages which include both high and relatively small voltages. It should be mentioned, that the circuit having the overvoltage arrester maybe subjected to an alternating current of small voltage which may also destroy the equipment which is being protected by the arrester. In such a case, the small thickness of the metal sheets due to thermal distortion caused by the different rate of heat dissipation will bend into contact with each other to form the internal short circuit and the arrester will function to protect equipment subjected to undesirable small alternating currents.

In a practical embodiment of the invention, the thickness of the metal sheet **5** is 0.5 millimeters and the width of its protruding or marginal edges is 0.6 millimeters. With a selection of iron as the material for the metal sheet **5** and with the distance between electrode surfaces of 0.5 millimeters, a safe short circuiting is obtained for an overload in all over voltage ranges. The short circuit with the destruction of the arrester due to the melting of one or both of the metal sheets **5** as illustrated in FIG. **1** need not occur. In FIG. **2**, a continuous short circuit might occur when the marginal surfaces or edges or metal sheets **5** bend into engagement with each other and then stick together such as by welding. Such a bending of the marginal surfaces of the metal sheets **5** will occur when the thickness of the metal sheet **5** is equal or smaller than 0.5 millimeters and an arrester with the metal sheets of that size has a relatively low short circuit characteristic. The short circuit as illustrated in FIG. **1** results in the corresponding increase thickness of the metal sheets and is selected if a high short circuit characteristic is demanded.

In the embodiment of the arrester illustrated in FIG. **3**, the sheet metal plates **5** are provided with a dish-shaped recess **7** at the center with the outer surface of each of the sheets **5** being attached to their respective electrodes **1** and **2** at the outer surface of the recess **7**. In such an arrangement, the peripheral or marginal edge of each sheet is increased and is spaced from the surface of its electrode with a corresponding decrease in the area of contact between the sheet **5** to its corresponding electrode surface which contact is formed by the connection made by welding or soldering the outer surface of the recess **7** to the electrode surface. Since the sheets **5** are attached by the recess **7** to the electrode surface, the marginal edge portions are spaced closer together than the recess portions. This arrangement allows a variation in the heat conductivity between the metal sheet **5** and electrode surface and enables the short circuit characteristic to be varied independent of the size of electrode surfaces of electrodes **1** and **2**.

The advantages of the overvoltage arrester according to the present invention are obtained due to the enlarged diameter of the small or the thin metal sheet **5** which is welded or soldered at least to one of the electrodes. One of these advantages is the active electrode surfaces is enlarged and thus the voltage resistance of the arrester is increased. Furthermore, the protruding marginal surfaces screen the insulating member **3** of the gas tight housing from sputtering or evaporating electrode material to maintain the insulation of the arrester even after a long period of operation. The enlarged size of the metal sheet **5** also blocks or shields the gas tight connection **4** between the insulating member **3** and each of electrodes **1** or **2** from sputtering or evaporation of the electrode material.

Although minor modifications might be suggested by those versed in the art, it should be understood that I wish to employ within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim:

1. In an overvoltage arrester having a pair of electrodes arranged in a gas tight housing with the electrode surfaces in a spaced facing relationship and at least one of the electrode surfaces carrying a small metal sheet, a portion of a surface of said sheet connected to the surface of the electrode, the sheet forming an electrical connection between the pair of electrodes to provide an internal short circuit during the application of an overload voltage to the arrester, the improvement wherein the metal sheet has a diameter larger than the diameter of the portion of said sheet which is connected to the electrode surface of the electrode so that the marginal edge of said metal sheet extends past the portion of the sheet connected to the electrode surface.

2. In an overvoltage arrester according to claim **1**, wherein each of the pair of electrodes has a metal sheet of a diameter greater than the diameter of the sheet surface attached to the electrode surface.

3. In an overvoltage arrester according to claim **1**, wherein the metal sheet has a dish-like recess at its center and is electrically connected to the electrode surface at the dish recess so that the peripheral edge of the metal sheet is spaced from the electrode surface of the electrode.

4. In an overvoltage arrester according to claim **3**, wherein each of the pair of electrodes has a metal sheet with a dish-like recess, said sheet being arranged on the pair of electrodes with the marginal edges in a closer spaced relationship than the center portions of the metal sheets.

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