

[54] EHV RAIN-SHIELD AND VOLTAGE GRADING RING FOR HIGH-VOLTAGE EQUIPMENT

[75] Inventors: Charles W. Tragesser, Murrys ville; John R. Perulfi, Monroeville, both of Pa.

[73] Assignee: Westinghouse Electric Corporation, Pittsburgh, Pa.

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[58] Field of Search..... 174/30, 139, 140 R, 140 H, 174/140 S, 141 R, 142, 143, 144, 150, 211

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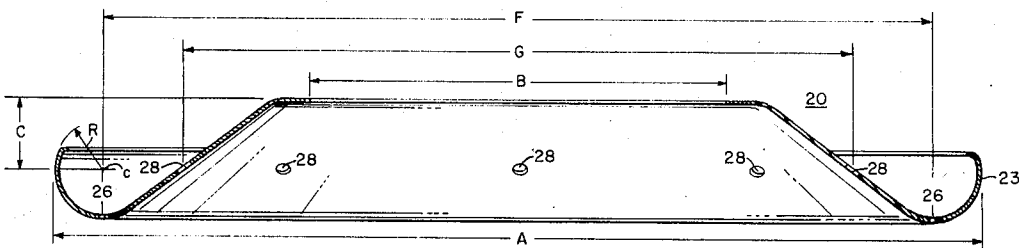
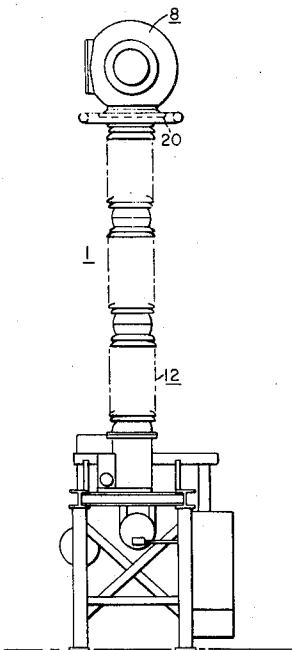
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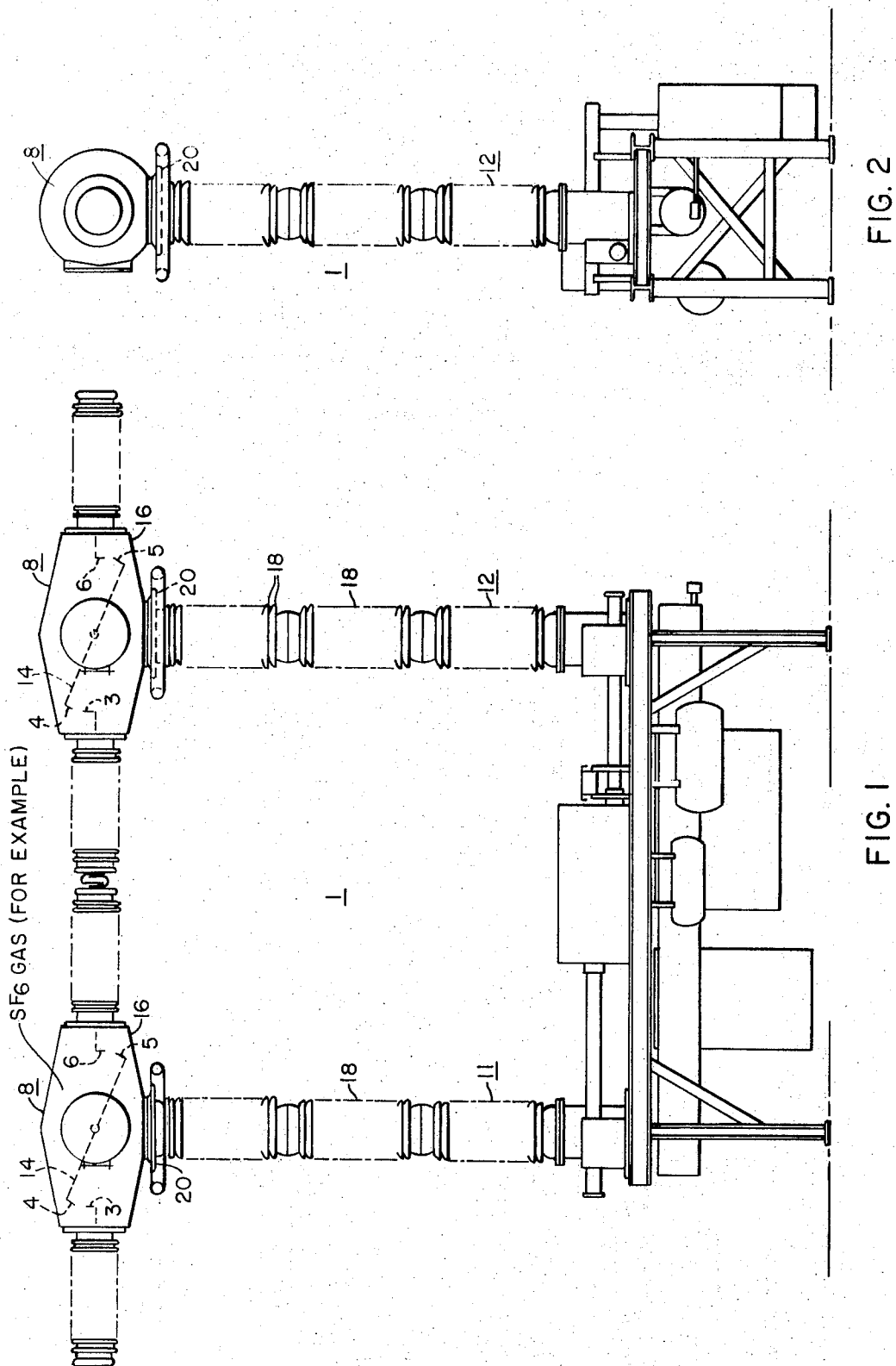
Primary Examiner—Laramie E. Askin
Attorney, Agent, or Firm—W. R. Crout

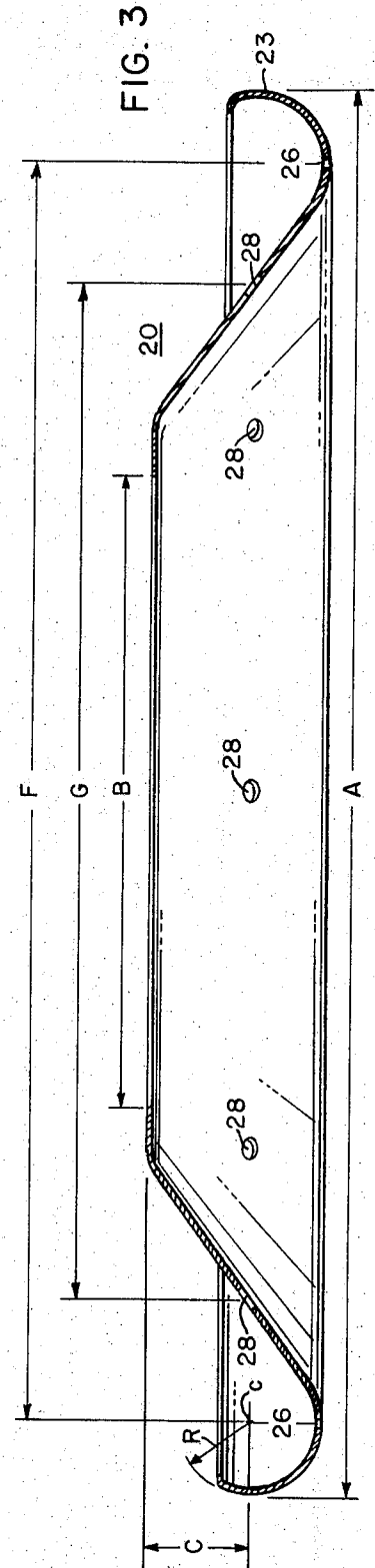
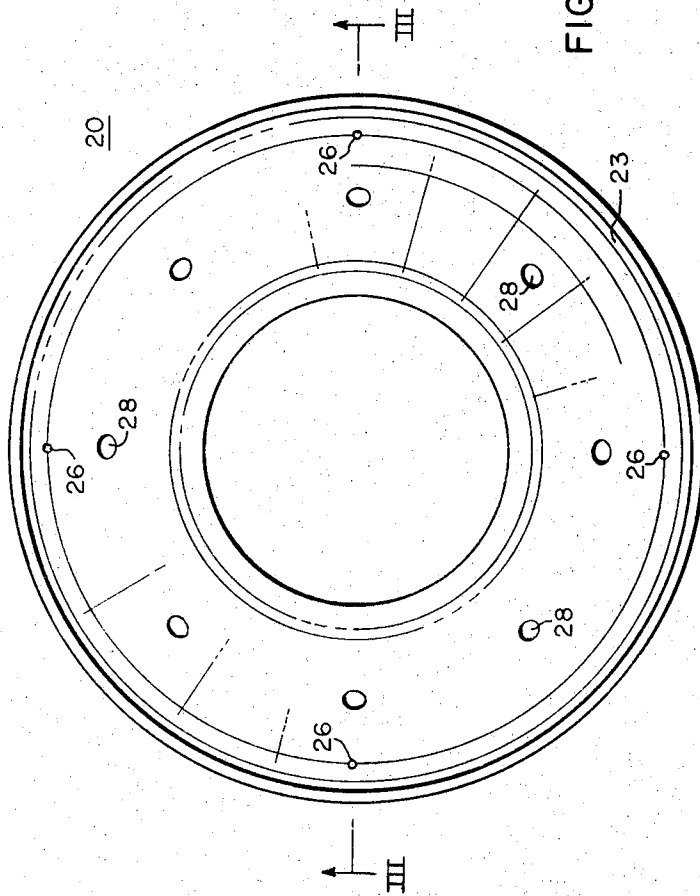
[57] ABSTRACT

A combined rain-shield and voltage grading ring is provided for the upstanding insulating column of a high-voltage circuit interrupter, or of other high-voltage equipment, to provide a variety of functions, namely voltage-gradation along the length of the upstanding insulating column, and, additionally, to prevent the water from cascading down the column, which would reduce the voltage-withstand of the upstanding supporting column.

5 Claims, 4 Drawing Figures







EHV RAIN-SHIELD AND VOLTAGE GRADING RING FOR HIGH-VOLTAGE EQUIPMENT

CROSS-REFERENCES TO RELATED APPLICATIONS

Applicants are not aware of any related applications pertinent to the present invention.

BACKGROUND OF THE INVENTION

As well known by those skilled in the art, various means have been provided to prevent the cascading of water, during heavy rain storms, down the "petticoats" of upstanding insulating columns, used in circuit-breakers, and for supporting other high-voltage electrical equipment, as desired. It will, however, be understood by those skilled in the art that the present invention may be applied not only for circuit-breaker applications, but for supporting any high-voltage electrical equipment up in the air at a location, where an upstanding insulating column is employed, for supporting purposes, between the high-voltage members and ground potential.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a rain-shield and a voltage grading ring at the upper end of the upstanding insulating column, for supporting a high-voltage circuit interrupter, or other high-voltage equipment, as desired. It will, however, be understood by those skilled in the art that the present invention may be applied not only for circuit-breaker applications, but for supporting any high-voltage electrical equipment up in the air at a location, where an upstanding insulating column is employed, for supporting purposes, between the high-voltage members and ground potential.

Accordingly, it is a general object of the present invention to provide an improved rain-shield for an upstanding insulating column, which additionally provides a desirable voltage-gradation function.

Another object of the present invention is the provision of an improved toroidal rain shield, which is easily fabricated, and which has an adequate conducting surface, which will, in addition to the rain-shielding function, serve a voltage-gradation function by its capacitance to ground.

Still a further object of the present invention is the provision of an improved rain-shield and voltage gradation member, which may be readily installed, and easily removed, and will, additionally, serve to collect the water in an outer annular collector, so that the collected water will drain downwardly through preselected drain holes at desired locations.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an application of the present invention to a high-voltage circuit breaker;

FIG. 2 is an end elevational view of the high-voltage circuit-breaker of FIG. 1;

FIG. 3 is a considerably enlarged sectional view of the combined toroidal rain-shield and voltage-gradation member of the instant invention taken substantially along the line III-III of FIG. 4 looking in the direction of the arrows; and,

FIG. 4 is a top plan view of the rain-shield of FIG. 3 drawn to a reduced scale.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2 of the drawings, it will be observed that there is provided a high-voltage circuit-breaker structure generally designated by the reference numeral 1, which may, for example be suitable for a voltage use of 500 KV, 750 KV, or 1,100KV, for example. Reference may be made to U.S. Pat. Nos. 3,327,082 - Van Sickle et al; 3,433,913 - Leeds; and 3,457,530 - Van Sickle, all assigned to the assignee of the instant application, for a description of the operation and function of the circuit-breaker structure. For the purpose of the present invention, however, it is only to be known that separable contacts 3, 4 and 5, 6 are provided in each of the interrupting units 8, supported at the upper ends of the insulating upstanding porcelain columns 11, 12. This is diagrammatically represented in FIG. 1 by the contacts 3, 4 and 5, 6 making separable contacting engagement with a rotatable contact member 14, all disposed interiorly within a housing 16, which confines a suitable arc-extinguishing gas at, say a pressure of 60 psi, for example. The gas may be any suitable arc-extinguishing gas, but, for example, sulfur-hexafluoride (SF_6) gas is utilized as the preferred arc-extinguishing gas.

As well known by those skilled in the art, annular corrugations, or "petticoats" 18 are formed upon the outer surface of the insulating sections 11, 12 so as to increase the surface-creepage paths lengthwise along the porcelain columns 11 or 12.

It has been well known in the past to provide rain shields to prevent the water cascading down along the columns. See the aforesaid patents in this connection. In accordance with our invention, however, an extra-large rain-shield 20, which has adequate capacitance to ground, is provided at the upper end of each porcelain column 11 or 12.

FIGS. 3 and 4 are detailed views of the specific toroidal rain-shield 20, indicating that it may be fabricated by rolling, spinning or otherwise. A collecting rim 23 is provided at the outer periphery of the rain-shield 20, and a plurality of circumferentially spaced "weep" holes 26 are provided therein, as indicated in FIG. 4, to permit the water to drain downwardly through the holes 26, and spaced radially outwardly from the outer surface of the corrugated porcelain sections. Additional "over-flow" drain holes 28 are provided also spaced away from the surface of the columns to take care of heavy-rain conditions.

The surface area of the annular toroidal rain-shield 20 is adequate enough to provide a desired capacitance to ground, and, thereby, to provide a desirable voltage-gradation function, in addition to the rain-shielding function.

The extra-high-voltage circuit-breaker 1, as illustrated in FIGS. 1 and 2, is of the live-tank design, and employs the insulating columns 11, 12 of porcelain, which may be, for example, 20 feet high, to insulate the "live" or high-voltage tanks 16 from ground. The porcelain columns 11, 12 are under voltage stress. In order to use the column to its greatest advantage, a voltage grading ring 20 is employed at the top, which reduces the maximum voltage stress upon the column. A rain-shield is also needed to prevent water from cascading down the column, which would reduce the voltage-withstand of the column. An important function of the

present invention is to combine the two functions into a one-piece spinning. The outer radius does the voltage grading, and the inner holes 26 allow the water to run off, and to miss the porcelain columns, which prevents the water from cascading.

By way of example only, the distance across the outer surfaces of the rain shield, as indicated by the reference letter A, may be, for example, 54.12 inches in diameter. The diameter of the opening, as indicated by the reference letter B, may, for example, be 24.25 inches in diameter. The diameter F across the two diametrically opposite drain holes 26 may be, for example, 48.56 inches in diameter. There may, for example, be eight equally spaced drain holes 28, located inside of the 40.25 inch diameter dimension G, spaced at roughly 45 angular degrees apart, as indicated in FIG. 4 of the drawings. The shield itself, may, for example, be made of 0.125 inch-thick aluminum sheeting. The dimension lengthwise along the rain shield, as indicated by the reference letter C, may be, for example, 4 inches. Naturally as well known by those skilled in the art, for a different diameter insulating column, the dimensions would vary according to the requirements. The capacitance value of the ring 20 to ground varies with the different height columns which are used. A range of capacitance values would be approximately 10 to 20 picofarads.

Although the drawings indicate the application of the invention to a circuit-breaker structure 1, it will be obvious to those skilled in the art, that the invention has applicability to other structures, supporting any high-voltage electrical equipment up in the air, such as, for example, a transformer, transmission-line conductor, etc.

Although there has been illustrated and described a specific structure, it is to be clearly understood that the same was merely for the purpose of illustration, and that changes and modifications may be readily made therein by those skilled in the art, without departing

from the scope of the invention.

What we claim is:

1. High-voltage electrical equipment including an upstanding insulating supporting column structure of considerable length, high-voltage conducting members supported at the upper end of said upstanding supporting column structure, a conducting annular sheet-like rain-shield and voltage-gradation member fixedly supported adjacent the upper end of the insulating supporting column structure to prevent rain water from cascading down the outside surface of the upstanding insulating supporting column, said member being of smooth frusto-conical configuration sloping generally horizontally outwardly and only slightly downwardly away from the column structure with the outer edge rim thereof curving upwardly and away from the column structure forming a toroidal gradation shield and water-collector as viewed from below, and a series of circumferentially disposed drain holes (26) located at the bottom of the water-collector to force water to drain downwardly and outwardly away from the surface of the supporting insulating column.

2. The combination of claim 1, wherein two sets of drain-holes are provided, one set (26) being relatively of small size, and the other set (28) spaced inwardly from the one set and being of larger size and adapted for heavy rain-flow conditions.

3. The combination according to claim 1, wherein a circuit-breaker unit is disposed at the upper extremity of the upstanding insulating column.

4. The combination according to claim 1, wherein the insulating column includes a plurality of petticoats thereon.

5. The combination according to claim 1, wherein the capacitance value of the conducting rain-shield and voltage-gradation member to ground falls within the capacitance range from 10 to 20 picofarads in value.

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