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Description

Various types of lightning rods have been developed which are provided with a radio-active source to facilitate the arrival of the strokes to the lightning rod point.

It has been experimentally established, that a radio-active source, positioned in the vicinity of the lightning rod point improves protection against lightning (inasmuch the sources have a ionizing power strong enough), i.e. facilitates the arrival of the strokes to the lightning rod point as a result of the ionization which takes place in the vicinity of the lightning rod point. In stormy weather, this ionization strongly contributes to the formation of a preferential conductive channel between the electrified cloud and the lightning rod point. The lightning will fall from the cloud on the lightning rod instead of striking in the surrounding area.

The use of an electric field to act upon the radio-active particles emitted by such radio-active sources associated with lightning protectors to improve their efficiency by increasing the distance at which the air is ionized has been disclosed in a number of patents (see for example U.S.-A-2,025,338 and 2,644,026, It-A-610.061, At-A-177.178 and GB-A-429.004).

However nowadays, the use of radio-active sources in association with lightning rods is meeting an increasing opposition from both authorities and users, because of their danger. In most countries, the use of radio-active substances for lightning protectors has already been purely and simply prohibited.

In the German published application DE-B-1 089 440, it is proposed to produce an ionization by impacts in the immediate vicinity of a lightning rod point by means of a source of high tension current achieving an electrical discharge in this immediate vicinity. However, the case of a source of high tension in the vicinity of the lightning rod point is not without danger and involves a not negligible energy consumption.

The author of the present invention proposes to produce such an ionization by impacts in the immediate vicinity of a lightning rod point, using the atmospherical electricity itself to produce one or several electric arcs. This avoids the mentioned drawbacks and brings the considerable advantage that, while the weather is fair, no arc is produced, whereas in stormy weather, the arc formation is produced automatically with an intensity the higher the electrically charged clouds are near, this increasing the ionization right when it is necessary, to help to direct the lightning stroke in direction of the lightning rod point.

The present invention has as object a lightning rod assembly according to claim 1.

The appended drawing illustrates, by way of example, an embodiment of this invention. This single FIGURE is a cross-sectional view of the upper portion of this embodiment.

The FIGURE shows a lightning rod 1, the point 2 of which is designed to receive the lightning strokes. This rod is connected to the upper end of a conductor 3, the lower end of which is connected to the ground in accordance with the normal practices. The rod 1 is held by usual means—not illustrated—in a coaxial insulator 4. This insulator 4 is fastened to a tube 5, which holds the assembly by known means—not illustrated—at the top of a building, a watercraft or a structure (such as a radio or television transmitting station) to be protected against lightning. The different components described above are all well known in the art. The part which is new and original consists of a metal device 6 fastened by known means—not illustrated—to the insulator 4 in such a manner as to be well isolated electrically from both the rod 1 and the ground conductor 3. The device 6 comprises a first arm 7, which acts as an electric probe and extends radially from the insulator 4 to a distance which can be, for example of 10 to 20 cm. or more. The free end of the arm 7 is provided in this embodiment with three sharp spikes 8, 9 and 10. The arm 7 with its spikes 8, 9, 10 acts to adjust the electric potential of the device 6 to the electric potential of the surrounding atmosphere.

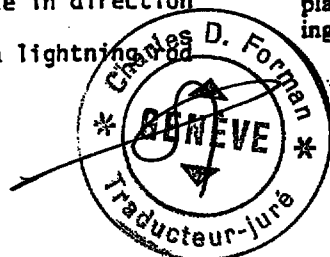
The device 6 also comprises a second arm 11, the free end 12 of which is pointed and positioned in a close relationship with the lightning rod point 2. This free end 12 acts as an electrode, as shall be seen further.

In another embodiment, a plurality of devices such as 6 are positioned on the insulator 4, so as to extend radially therefrom. In yet another embodiment, the spikes 9 and 10 of component 7 are deleted, with only spike 8 remaining.

The device functions as follows:

It is well known that in stormy weather, the potential in the atmosphere increases from the ground upwards. The potential gradient can reach thousands, if not tens of thousands of volts per meter in elevation. The component 7 of device 6 acts to bring this device to the same potential as the surrounding atmosphere. The spikes 8, 9 and 10 function to speed up by the well known effect sharp points have the adjustment of the potential of the device 6 to that of the surrounding atmosphere.

In stormy weather, the voltage which appears across the gap between the sharp end 12 (which is at the same potential as the surrounding atmosphere) and the rod 1 increases to a level where an electric discharge takes place between 12 and 1. This discharge results in bringing momentarily the potential of the component 7 to



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zero, whereby the discharge is interrupted. The potential of the device 6 increases again to the same potential as the surrounding atmosphere, and a new discharge occurs between 7 and 1. In stormy weather, the successive discharges will recur at a high frequency, and the system will substantially behave as if the discharge were of a continuous nature. As confirmed experimentally, this electric discharge creates in the atmosphere above the point 2 a conductive channel, which the lightning will preferably follow to reach the point 2 and pass the stroke to the ground through the ground conductor 3.

Accordingly, the lightning protector assembly which is the object of the present invention operates without a radio-active source, while offering the outstanding advantages of the lightning protectors provided with a powerful radio-active source. Furthermore, the efficiency of the new system increases with the intensity of the discharge occurring between 12 and 1, i.e. with the magnitude of the potential gradient in the surrounding air: the efficiency therefore increases as better protection from lightning is needed.

There is obviously a distinct advantage from the standpoint of safety to use instead of a bare ground conductor as 3, a conductor with a sheath, where the metal sheath is electrically isolated from the ground conductor and connected to the ground as the ground connector is. The Swiss Pat. No. 521.677 and the corresponding patents granted in other countries (particularly the U.S. Pat. No. 3,919,956 and the German Pat. No. 2.212.156) describe such an improved ground conductor for preventing secondary electric discharges from occurring, the danger of which is well established.

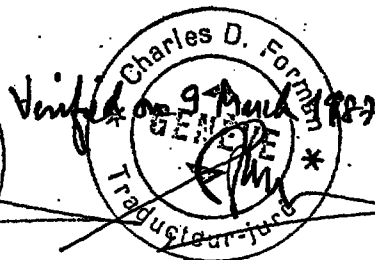
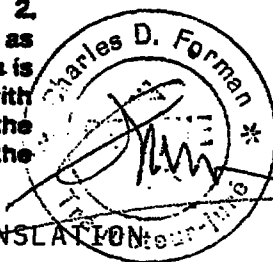
A system such as described can be used to protect not only buildings, watercraft and telecommunication stations, but also to protect high tension lines provided or not with protective conductors (wires or cables) electrically connected at each tower to the lower end of a lightning rod, which is connected to the ground preferably by a cable with a sheath.

Claims

1. A lightning rod assembly characterized in that it comprises at least one element (6) capable of conducting electricity disposed in the vicinity of the upper part (1, 2) of the lightning rod and electrically insulated from the tip (1, 2) and from the conductor (3) connecting the tip to the earth, said element (6) being provided on the one hand with a part (7) terminated by at least one point (8, 9, 10) for facilitating the adjustment of this element (6) to the electric potential of the atmosphere, and on the other hand with a second part (11) functioning as an electrode (12) and disposed at a sufficiently short distance from the rod (1) of the lightning rod assembly for allowing at least in the event of stormy weather an electric discharge to take place between the electrode (12) and the rod (1) of the lightning rod assembly as the result of the potential difference which develops between the conductive element (6) and the rod (1), the discharge being sufficient in itself to ionize by shocks the surrounding air, thereby increasing the efficiency of the lightning rod assembly in stormy weather.

2. An assembly according to Claim 1, characterized in that said first part (7) of the conductive element (6) is oriented in a generally radial direction with respect to the rod (1) of the lightning rod assembly.

3. An assembly according to Claim 1 or 2, characterized in that the part (11) functioning as an electrode (12) is terminated at the end which is close to the rod of the lightning rod assembly with a point for facilitating the occurrence of the electric discharge between this electrode and the rod of the lightning rod assembly.



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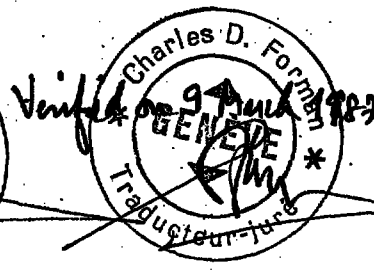
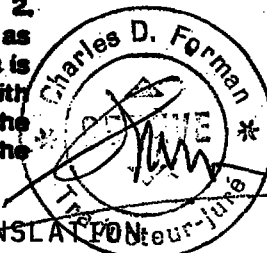
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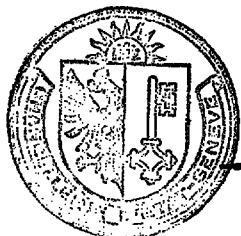
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Vu pour la légalisation de la signature de
M. Charles D. FORMAN.

à l'exclusion du document lui-même.

Genève, le 27 MARS 1998
la Chancellerie ~~Fédérale~~




Maurice FIUMELLI
chef de bureau

Droit de timbre
inclus