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ELECTRIC SAFETY DEVICE FOR THE FLOWING OUT OF EXCESS VOLTAGE.

APPLICATION FILED AUG. 12, 1908.

1,040,927. Patented Oct. 8, 1912.

Fig. 1.

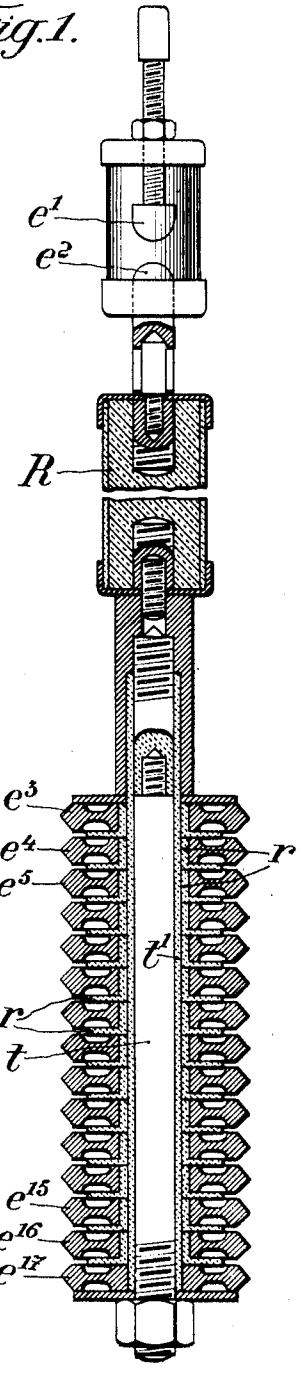


Fig. 2.

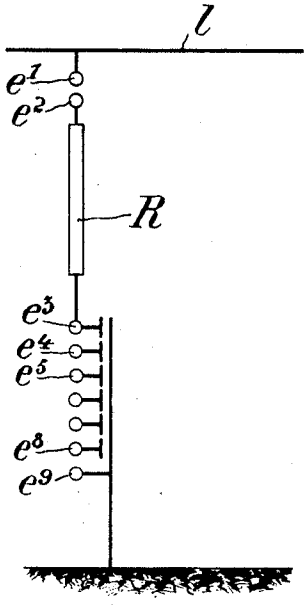
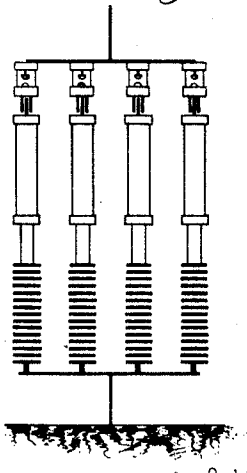


Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGES GILES, OF FRIBOURG, SWITZERLAND.

ELECTRIC SAFETY DEVICE FOR THE FLOWING OUT OF EXCESS VOLTAGE.

1,040,927. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed August 12, 1908. Serial No. 448,095.

To all whom it may concern:

Be it known that I, GEORGES GILES, engineer, citizen of the United States, residing at Fribourg, in the Canton of Fribourg and Confederation of Switzerland, have invented certain new and useful Improvements in Electric Safety Devices for the Flowing Out of Excess Voltage, of which the following is a specification.

The present invention refers to an electric safety device for the flowing out of excess voltage of which a constructional form is shown partly in section in Figure 1 of the annexed drawing. Fig. 2 is a schematic view showing the operation of the apparatus.

The apparatus shown in Fig. 1 comprises two electrodes e^1, e^2, between which is provided a spark gap the length of which may be adjusted by screwing or unscrewing a screw carrying the electrode e^1 and which can be maintained in any desired position by means of a locknut. The electrode e^2 is connected with one end of a high resistance R of f. i. 5 to 10000 ohms, in form of a tube surrounding an insulating core.

e^3, e^4 . . . are metallic disks with sharp edges forming a series of electrodes between which spark gaps are provided. Said disks are placed on a metallic rod t from which they are insulated by a tube t^1 of insulating material, f. i. of micanite, and by rings r of insulating material having flanges by which the disks are also insulated from each other. The electrodes e^3, e^4 . . . thus at the same time are constituting armatures of little condensers from which the second armature is constituted by the metallic rod t. The first electrode e^3 of the series is electrically connected with the resistance R and the last electrode of the series is in contact with the rod t. The apparatus being connected as shown in Fig. 1 with a line l on one side, and with the earth on the other side, the electrode e^1 is at the potential of the line and the electrode e^2, as well as all the electrodes e^3, e^4 . . . of the series, are maintained at the potential of the earth by medium of the little condensers. The spark gap between the electrodes e^1, e^2 is adjusted so that a spark springs between the electrodes as soon as the voltage in the line l attains the value from which it is desired to obtain the flowing out of excess voltage. It being admitted that this voltage is of 10,000 volts, and that it has been attained, a spark springs between e^1 which is at the potential 10,000 and e^2 which is at the potential 0. The current thus formed will be very weak because it has to flow through the condensers and the drop of voltage between e^1 and e^2 will be approximatively of 500 volts. The drop of voltage in the resistance R will equally be weak according to the weakness of the current and the electrode e^3 will therefore be charged approximatively to the potential

$$10{,}000-500=9{,}500.$$

The electrode e^4 being always to the potential 0, a spark springs between e^3 and e^4 and the electrode e^4 is charged to the potential

$$9{,}500-500=9{,}000.$$

Sparks will similarly spring between e^4 and e^5, e^5 and e^6, etc., each time with a drop of voltage of 500 volts, a cascade starting of the sparks between the disks being thus obtained. The number of the disks is taken such that when the sparks have thus been started until the last but one electrode, a sufficient difference of potential, of 2 to 3000 volts approximatively, is remaining for starting a spark between the two last electrodes. When all sparks are started, the flowing out of the excess voltage is produced directly through e^1, e^2, R and the series of electrodes, the last of which is metallically connected with the earth.

It has been found that the apparatus thus constituted has the property of permitting the flow of electricity only when the voltage exceeds the value for which the spark gap between e^1 and e^2 has been adjusted. As soon as the voltage is becoming inferior to that value, all sparks are ceasing by themselves without any blow out of the same. It has further been found that owing to the presence of the high resistance R any production of high frequency currents in the apparatus itself is avoided. The said resistance R is chosen according to the relation

$$C.R^2>4.L.$$

where C and L designate the capacity and the self-induction of the apparatus of the protected circuit. It was found that with a resistance larger than 5,000 ohms the production of currents with high frequency was practically prevented. At last it was found that when several apparatus formed as described above are placed in parallel as

shown in Fig. 3, the said apparatus, which practically will never begin to work exactly at the same instant, are working independently from each other, so that if a resistance R of say 10,000 ohms in one apparatus is producing no currents of high frequency, ten apparatus, each with a resistance of 10,000 ohms and placed in parallel will also produce no currents of high frequency. However the resistance equivalent to the ten resistances of 10,000 ohms placed in parallel is only 1000 ohms and currents of high frequency are produced when only one apparatus with a resistance of 1000 ohms is employed.

The apparatus described above is particularly suitable for obtaining the flowing out of excess voltage produced by resonance phenomena of low frequency in cable networks. For high frequency phenomena produced in aerial lines by atmospheric influences, the employment of condensers is always the best system.

Claims:

1. An apparatus of the character described having a series of annular electrodes; a series of rings of insulation formed with outwardly-extending flanges which separate said electrodes from one another; and a metallic rod which passes through said rings of insulation and is separated from all except one of said electrodes by said rings, whereby starting condensers are formed to which said rod is common as the second armature thereof; the excepted electrode being directly connected to said rod.

2. An apparatus of the character described having a series of annular electrodes; a series of rings of insulation formed with outwardly-extending flanges which separate said electrodes from one another; a metallic rod which passes through said rings of insulation and is separated from all except one of said electrodes by said rings, whereby starting condensers are formed to which said rod is common as the second armature thereof, the excepted electrode being directly connected to said rod; a line-wire electrode which is separated from said metallic rod by a main spark-gap; and an ohmic resistance arranged in series with said rod.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGES GILES.

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