March 10, 1964 F. ALEXANDER 3,124,712

LUMINOUS HIGH TENSION INDICATOR

Filed April 27, 1961

FIG. 1

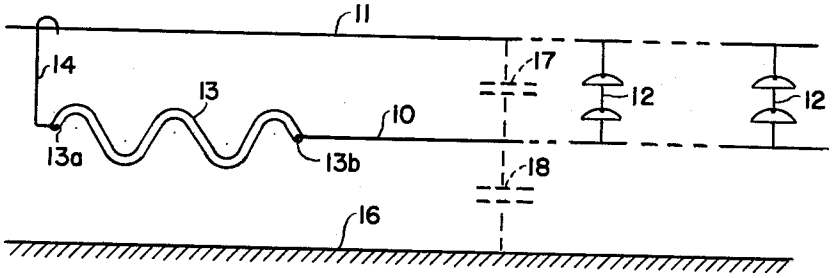


FIG. 2

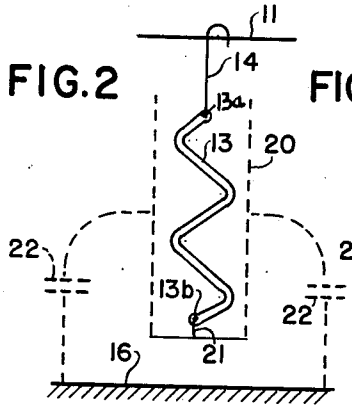


FIG. 3

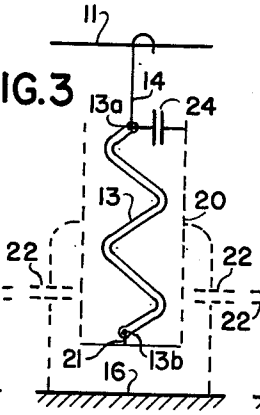


FIG. 4

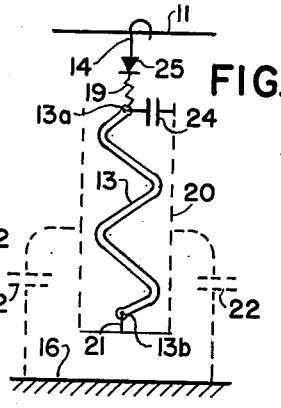


FIG. 5

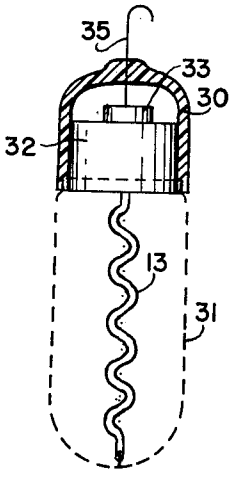


FIG. 6

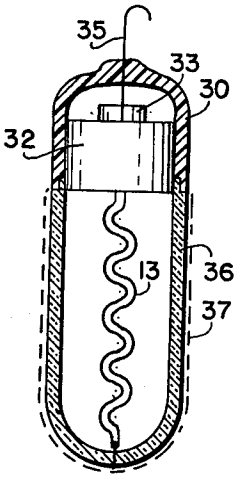


FIG. 7

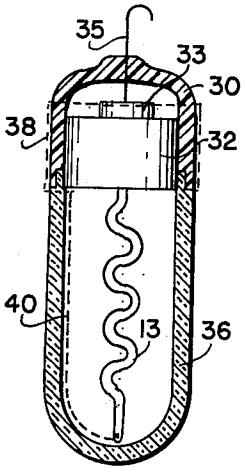
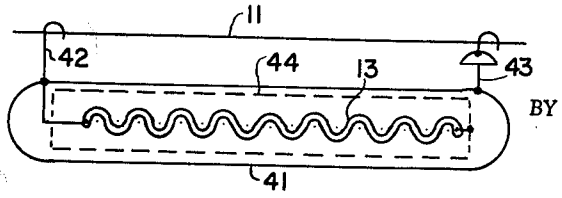


FIG. 8



INVENTOR.
F. Alexander
BY

ATTORNEY.

United States Patent Office 3,124,712 Patented Mar. 10, 1964

3,124,712

LUMINOUS HIGH TENSION INDICATOR

Focsaneanu Alexander, 3011 153rd St., Flushing, N.Y.

Filed Apr. 27, 1961, Ser. No. 106,104
4 Claims. (Cl. 313—202)

The present invention relates to a luminous high tension marker or indicator for use on A.C. high tension or extra high tension transmission lines or systems to serve as a guide or warning signal for airplanes, or in general to indicate the presence of high electric tension in generating, transforming, transmission and the like electrical installations. More particularly, the invention is concerned with devices of this type utilizing a luminous gaseous discharge device or flash tube designed for unipolar connection to or direct energization from an A.C. high tension carrying part, such as a high tension line, supporting pole or tower, or the like high tension structure.

It has already been proposed to energize a luminous gas discharge device directly from an A.C. high tension transmission line by the provision of an auxiliary cable or conductor suspended from and extending over a substantial length of and at close spacing distance from said line, to form a capacitative voltage divided or coupling circuit by the mutual capacities between the conductor and the line, on the one hand, and between the conductor and ground, on the other hand. A gaseous discharge tube is connected between the conductor and the line to be energized by capacitative coupling with said line, to produce a luminous warning or indicating signal.

A major disadvantage of arrangement of this type is due to the fact that for practical purposes the auxiliary conductor must have a considerable length, that is, from about 10 to 50 meters to provide an adequate capacity coupling required for supplying the energy for the maintenance of a sustained gaseous discharge through said tube. Furthermore, such indicators, while limited to suspension from a line and requiring a considerable number of parts or insulators and special installation operations, are further subject to the influence of adverse atmospheric conditions, in particularly wind and storms, likely to interfere with the proper operation thereof and making necessary frequent repairs, aside from other drawbacks and defects as will be understood.

Accordingly, among the objects of the present invention is the provision of an improved A.C. high tension indicator or marker of the general type referred to which is substantially devoid of the foregoing and related difficulties and drawbacks inherent in the known devices according to the prior art; which is both simple and compact in design and construction as well as of low cost in manufacture; which may be suspended from or otherwise connected to a high tension carrying part or line instantly or without requiring any special skill or installation operations; and which will be substantially unaffected by varying atmospheric conditions in providing a safe and efficient guide or high-tension warning signal.

The invention, both as to its ancillary objects as well as novel objects, will be better understood from the following detailed description taken in conjunction with the accompanying drawing, forming part of this specification and in which:

FIG. 1 is a diagrammatic representation of a known gaseous high tension indicator utilizing an extended auxiliary conductor or cable as a coupling means with a high tension line and shown for the purpose of better understanding of the improvements according to the present invention;

FIG. 2 is a schematic basic diagram illustrating the improved high tension indicator constructed in accordance with the principles of the invention;

FIGS. 3 and 4 are views similar to FIG. 2, illustrating improved features thereof;

FIGS. 5 to 7 illustrate examples of practical forms for carrying into effect the invention; and

FIG. 8 is a diagrammatic view of still another practical embodiment of the invention.

Like reference numerals denote like parts in the different views of the drawing.

With the foregoing objects in view, the invention involves generally the provision in connection with a gaseous discharge or flash tube, used as a luminous high tension indicator or warning device, of an extended metallic electrode or conducting surface in relatively fixed relation to and forming an integral part of the device, such as in the form of a light-pervious coating or enclosure directly applied to the wall of or forming a separate protective cover of said tube, said tube having a first electrode adapted or constructed for direct connection to or suspension from an A.C. high tension carrying part, such as a transmission line, and having a second cooperating electrode electrically connected to said metallic or conducting surface.

In an arrangement of this type, with the mutual capacity between said conducting surface or electrode and the high tension line being negligible, the impedance of the tube forms a voltage divider together with the mutual capacity between said surface and ground, in such a manner as to supply a small A.C. energizing current for the maintenance of a sustained luminous gas discharge through said tube, provides a proper design of the tube to have a critical or breakdown voltage less than the applied fractional voltage of the total voltage between said line and ground.

According to an improved feature of the invention, the gaseous discharge tube or indicator is shunted by an auxiliary capacitor, to improve and stabilize the operation of the tube. According to a further improvement, the provision of a series rectifier preceding the tube and auxiliary capacitor results in an intermittent in place of a continuous operation or luminous discharge, that is, in a series of luminous flashes indicating the presence of the high tension carrying part to which the device is connected.

Referring more particularly to FIG. 1 of the drawing, there is shown a well-known high tension marking or indicating device comprising a cable or auxiliary conductor 10 suspended from an A.C. high tension or extra high tension line 11 and extending parallel to and at close spacing from said line. The conductor 10 is supported by means of a plurality of high voltage suspension insulators 12 and has one end connected to the line 11 by way of a lead or conductor 14 and a gaseous discharge tube 13 containing a suitable rarified gaseous atmosphere and having pair of electrodes (anode and cathode) 13*a* and 13*b*. In an arrangement of this type, since the surface of the auxiliary cable 10 is rather limited relative to the surface presented by the line 11, a cable or auxiliary conductor 10 of considerable length is required, to ensure an effective coupling or energy supply for the tube 13 by the voltage divider or coupling circuit comprised of the mutual capacitance 17 between the conductor 10 and the line 11, on the one hand, and the mutual capacitance 18 between said conductor and ground 16, on the other hand. This, in turn, requires especially skilled labor for the installation of the device, not considering the costs of the substantial number of high tension insulators and other parts required. Furthermore, a device of this type is subject to the effects of atmospheric influences, such as winds and storms, liable to interfere with the proper and safe functioning or to completely interrupt the operation of the device.

Referring to FIG. 2, there is shown diagrammatically

a basic high tension indicator according to the invention, comprising a luminous gaseous discharge tube 13 having one of its electrodes 13*a* adapted, as shown at 14, for direct connection with or suspension from a high tension carrying part, such as a transmission line 11, and having its cooperating electrode 13*b* electrically connected, as at 21, to a light pervious conducting screen or the like protective enclosure 20 of said tube. In an arrangement of this type, with the mutual capacitance between the electrode 20 and the line 11 being practically negligible, the electrical impedance of the tube 13 together with the mutual capacitance 22 between the electrode or surface 20 and ground 16 forms a voltage divider or coupling circuit, resulting in the energization of the tube 13 by the A.C. high voltage current of the line 11, provided a proper design of the tube such as to cause the voltage drop between the tube electrodes 13*a* and 13*b* to be equal to or greater than the critical or ionizing voltage of the rarified gaseous atmosphere within said tube. The higher the operating or line voltage, the easier this condition may be fulfilled and the simpler and more efficient will be the design and construction of the device. The latter may be suspended from a desired point of the line 11, in the manner shown in the drawing, or otherwise connected to or mounted upon a high tension carrying part of a transmission system. The invention is accordingly of special advantage for use in connection with very high or extra high voltages of the order of from about ten thousand to several hundred thousand volts. The electrode or envelope 20 may be in the form of a metal screen, perforated cylinder or the like designed to allow the passage of an adequate amount of the light produced by the gaseous discharge within the tube 13. Alternatively, the enclosure or housing 20 may consist of glass or another transparent or translucent insulating material to the surface of which is applied a thin metallic screen or light pervious conducting coating or layer produced by means of a known metallization process, or in any other suitable manner known in the art. Finally, the light pervious metallic or conducting layer may be directly applied to the surface of the discharge tube 13 to serve as an extended electrode surface for the purpose of the present invention.

According to an improved embodiment of the invention, in an effort to stabilize the operation of the discharge tube and to increase the A.C. energy coupling with the line 11, as well as to enhance the flexibility and usefulness of the device, the tube 13 may be shunted by a capacitor 24 of suitable size or electrical capacitance, as shown in FIG. 4 of the drawing, in such a manner as to provide a capacitative voltage divider in cooperation with the mutual capacitance 22 between the electrode 20 and ground 16. Furthermore, in order to further improve the operation of the device and to increase the efficiency of the energy coupling with the line 11, the tube 13 together with its shunt capacity 24 may be preceded by a series rectifier 25, the latter preferably being of the dry or solid state type and serially connected in the terminal conductor or lead 14, in the manner more clearly shown in FIG. 4.

In an arrangement of the latter type, the operation of the tube 13 will be intermittent by the alternate charging of the capacitor 24 through the rectifier 25 and subsequent breakdown of or discharge through the tube upon reaching the ionizing or critical operating voltage of the tube. This operation, which results in the production of a consecutive series of discrete luminous flashes, is not only advantageous for the special use of the device as a warning signal or marker by attracting attention in preference to interfering neighboring and continuous light sources, but has the further advantage of enabling the capacitor 24 to accumulate a sufficient amount of electrical energy or charge during the intervals between successive light flashes such as to result in the production of an intense and instantaneous discharge of the tube at the instant of reaching the breakdown voltage by the capacitor during a charging operation. If desirable, a series resistor 19 may be provided in the lead or conductor 14, to control the flashing rate or frequency, in a manner readily understood. In a similar manner, the length or duration of the light flashes may be controlled to achieve an optimum luminous effect and efficiency by the insertion of a resistor or inductor in the discharge circuit or in series with the tube 13 and capacitor 24.

FIGS. 5 to 7 illustrate in greater detail various constructional embodiments of a luminous high tension suspension indicator or marker according to the invention. More particularly, according to FIG. 5, the device may consist in a simple manner of an insulating cap or the like support 30 having attached or otherwise secured thereto a cylindrical protective metal screen 31 enclosing the discharge tube 13. The latter may be of well-known helical or the like shape or construction, to obtain the desired operating or breakdown voltage. Mounted within the cap 30 may be a capacitor 32 and rectifier 33, being electrically connected within one another and the other parts of the circuit in the manner as shown by FIG. 4. The complete device or assembly may be simply suspended from a line 11 by the hook-shaped construction of the terminal conductor 35, or by any other suitable means which will suggest themselves to those skilled in the art.

FIG. 6 shows a similar construction with the metal screen of FIG. 5 being replaced by a transparent insulating protective enclosure 36, such as glass or the like, being covered by a thin metallic net or coated by a light pervious metallized or the like conducting coating or layer 37. FIG. 7 shows an alternative construction, wherein the metallic surface or electrode 38, corresponding to the electrode 20 of FIGS. 2 to 4, is applied to the surface of the cap 30 and connected to the lower electrode of the tube 13 through a metallized strip or the like 40 applied to the wall of the enclosure 36.

Finally, FIG. 8 shows schematically a construction of a luminous high tension marker according to the invention comprising a cylindrical light pervious protective tube 41 enclosing the gas discharge tube 13 and being suspended at both ends from and parallel to a high tension line 11 through a conductor 42, on the one hand, and through a suspension insulator 43, on the other hand, the extended metal surface or electrode 44 being constituted in the example shown by a translucent metallized coating on the inside of the tube or enclosure 41, to form a floating electrode isolated from said conductor. The various parts are electrically connected in the manner shown by the previous figures, and the arrangement may comprise a stabilizing capacitor or a combination of a capacitor and rectifier, to effect an intermittent operation of the tube 13, in the manner described and readily understood from the foregoing.

In the foregoing the invention has been described in reference to a specific illustrative device. It will be evident, however, that variations and modifications, as well as the substitution of equivalent parts and elements for those shown herein for illustration, may be made without departing from the broader scope and spirit of the invention, as set forth in appended claims. The specification and drawing are accordingly to be regarded in an illustrative rather than in a restrictive sense.

I claim:

1. A device for indicating alternating current high tension comprising a luminous gas discharge tube having a pair of electrodes, an insulating light-pervious enclosure enveloping said tube, a terminal conductor extending from one of said electrodes through said enclosure and adapted for connection to a high tension carrying part to be indicated, a light-pervious floating electrode having an extended surface and mounted within said enclosure in electrically isolated relation from said conductor, and means electrically connecting said floating electrode to the remaining electrode of said tube.

2. A device as claimed in claim 1, said floating elec-

trode being comprised of a light-pervious metallized coating applied to the inside surface of said enclosure.

3. A device as claimed in claim 1, said floating electrode being comprised of a light-pervious metallized coating applied to the inside surface of said enclosure and substantially enveloping said tube.

4. A device as claimed in claim 1, said floating electrode being comprised of a light-pervious metallized coating applied to the outside surface of said tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,976,378 Vrooman ---------- Oct. 9, 1934

FOREIGN PATENTS

36,912 France ---------- May 13, 1930
205,698 Switzerland ---------- Sept. 16, 1939