

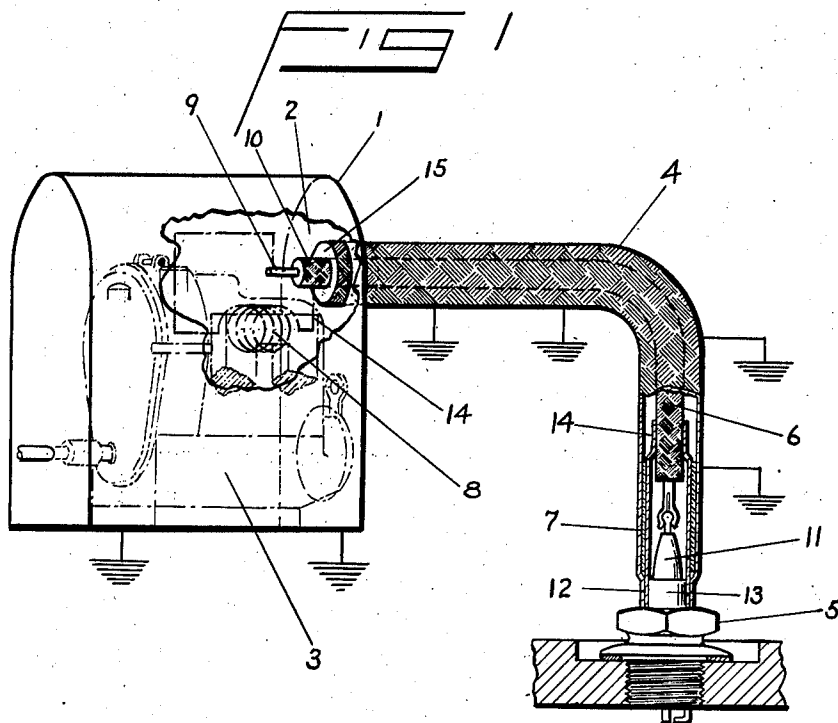
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SHIELDING DEVICE FOR IGNITION OR SIMILAR CIRCUITS

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SHIELDING DEVICE FOR IGNITION OR
SIMILAR CIRCUITS

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14 Claims. (Cl. 123—148)

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amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

5 This invention relates to improvements in electric transmission lines of high voltage and more in particular to improvements in electric transmission systems such as disclosed in the patent to Crook No. 1,645,643, in which a generator of electricity and a receiving instrument are disposed within a closed chamber and electrically connected in such a manner as to effect a non-grounded electric transmission line. In this system, the negative transmission line serves as a
15 shielding to prevent the emanation of electromagnetic field and its consequent disturbance or interference with other and separate receiving instruments by utilizing the opposing effects of currents in opposite directions, but the system does not provide for the elimination of the electrostatic disturbance of the negative line or the combined electrostatic disturbance of both positive and negative transmission lines. It is also well known that grounded electric transmission
20 lines of high voltage have been provided with metallic shielding to reduce physical hazard and only partially the electrostatic and electromagnetic disturbances by grounding the shielding. The system as disclosed in the above-referred-to patent has the further disadvantage that it would be unsafe to touch the negative conductor in case it should be broken because of the high voltage across the gap of the break and like the metal grounded shielding above-referred-to that does
25 not constitute a part of the transmission line, is subject to corrosion and abrasion.

It is, therefore, the primary object of my invention to provide in combination with a grounded electric transmission line of high voltages a metallic shielding that will practically entirely eliminate electromagnetic disturbances, prevent electrostatic disturbances, and safeguard against the breakage, abrasion and corrosion of the negative conductor of the transmission line, which otherwise would be dangerous to life and limb of individuals in contact therewith.

The invention is shown by way of example in the accompanying drawing in connection with a magneto, as the generator of a high voltage, and a spark plug as the receiver, it being understood that the invention is applicable to any high voltage transmission system.

In the drawing:

Fig. 1 is a diagrammatic perspective view with
55 parts broken away and in section, showing my in-

vention as applied to an airplane magnetic circuit.

Referring more particularly to the drawing the numeral 1 designates a closed shielding that consists of a grounded metal chamber 2 completely enclosing a source of high voltage such as a magneto 3, and a conduit 4, one end of which opens out into the chamber 2 and being electrically connected therewith. The other end of said conduit is adapted to receive a receiving instrument, such as a spark plug and is grounded to the engine (not shown) through intimate engagement with the base of the spark plug 5.

A shielded cable 6 for effecting an electric circuit between the source of high voltage and the receiving instrument is disposed within the conduit 4 and is insulated therefrom at and between points 7 and 15, the wire 9 of the cable constituting the supply or positive lead and the metal braided shielding 10 constituting the return or negative lead. The conduit is preferably constructed to be flexible and for this purpose it may be made of braided metal.

As illustrated herein the source of high voltage comprises a primary winding (not shown) and a secondary winding 8 inductively electrically coupled with the primary winding but not grounded therewith. The positive and negative leads of the secondary winding are respectively electrically connected to the wire lead 9 and metal braided shielding 10 of the cable 6, the lead in turn being connected to the central electrode terminal 11 of the spark plug and the shielding being grounded to the spark plug through a shielding cap 12 that is supported on the spark plug cap 13. The shielding cap 12 is formed with a restricted neck portion 14 to receive the cable 6 and to provide intimate electrical engagement with the cable shielding 10. The cap is insulated from the central electrode of the spark plug. By this arrangement the current runs from the secondary winding 8 over the wire 9 to the gap between the electrodes of the spark plug whence the high voltage created at the magneto causes the current to jump the gap and flow back to the secondary winding through the spark plug cap 13, the extension cap 12, the shielding 10 and the lead 16.

The outer shield is suitably insulated from the inner shield by means of a dielectric, such as air, rubber, porcelain, or the like, at all points except at points 12 and 13 at the base of the spark plug where both inner shielding 10 and outer shielding 4 are connected together and to the spark plug cap 13 which is connected to ground through the spark plug. The outer shield, which includes

the chamber 2 and conduit 4, is grounded at a number of closely spaced points along their effective length.

Having thus described my invention, what I claim is:

1. In combination with an electric circuit having a supply line and a return line electrically insulated therefrom and a receiving instrument electrically connected in said circuit between said lines, the said return line being grounded only at one end and both of said lines being so arranged that the magnetic field of the one is neutralized by that of the other, of a shielding enclosing said lines, said shielding being both electrically insulated from the supply line and grounded substantially throughout the entire length of the enclosure.

2. In combination with an electric circuit having a supply line and a return line electrically insulated therefrom and a receiving instrument electrically connected in said circuit between said lines, said lines being so arranged that the magnetic field of the one is neutralized by that of the other, of a metallic shielding enclosing said lines and electrically insulated therefrom at all points except for an electrical connection between the return line and the shielding at one end of the latter substantially at the connection of the return line with the receiving instrument, said shielding being grounded at its point of electrical connection with the return line and at closely spaced points substantially throughout the entire length of the enclosure.

3. In an electric circuit system, the combination with a source of current supply of a receiving means remote therefrom, a connecting circuit to transfer energy from said source to said receiving means and including a supply line and a return line insulated from each other, said connecting circuit having the return line grounded only at one end thereof and concentrically enclosing the supply line for a portion of the length thereof whereby the magnetic field of the one is neutralized by that of the other throughout said length, and a shield grounded substantially throughout its length and enclosing said lines to prevent electrostatic disturbances thereof.

4. In an electric circuit system, the combination with a source of current supply of a receiving means remote therefrom, a closed connecting circuit to transfer energy from said source to said receiving means and including a supply line and a return line insulated from each other, said connecting circuit having the return line grounded only at one end thereof and concentrically enclosing the supply line for a portion of the length thereof whereby the magnetic field of the one is neutralized by that of the other throughout said length, and a shield grounded substantially throughout its length and substantially insulated from but enclosing said lines and said source of supply to prevent electrostatic disturbances thereof.

5. In an electric circuit system, the combination with a source of current supply of a receiving means remote therefrom, a connecting circuit to transfer energy from said source to said receiving means and including a supply line and a return line insulated from each other, said connecting circuit having the return line thereof concentrically enclosing the supply line throughout the length thereof whereby the return line serves as a shield for the supply line throughout said length, and a metallic covering enclosing said lines and said source of supply to provide an

outer shield therefor to prevent electrostatic disturbances thereof, said last-mentioned shield being insulated from the said source and the said lines at all points except for a joint connection with the return line and with the ground at one end only, said covering being additionally and separately grounded at closely spaced points.

6. In an electric circuit system, the combination with a source of current supply of a receiving means remote therefrom, a closed connecting circuit to transfer energy from said source to said receiving means and including a supply line and a return line insulated from each other, said connecting circuit having the return line grounded only at one end thereof concentrically enclosing the supply line for a portion of the length thereof whereby the magnetic field of the one is neutralized by that of the other throughout said length, and a shield grounded substantially throughout its length and enclosing said lines and said source of supply and said receiving means to prevent electrostatic disturbances thereof said grounded shield being in electrical contact with the grounded end of the return line at one end and being insulated from the enclosed parts at all other points.

7. In an ignition system, a high tension source neither terminal of which is grounded, a spark plug, a shield mounted upon and grounded through said spark plug, a high-tension lead from one terminal of the said source to the spark plug provided with a shielding cover of metal braid connected to the other terminal of the high tension source at one end and to the spark plug shield at the other end, and a grounded shielding enclosing the high tension source and the shielded high tension lead and the spark plug shield and having a ground connection with the spark plug and spark plug shield substantially at the base of the shield, said grounded shielding being insulated from the high-tension source and the shielded high-tension lead and the spark plug shield at all points except at the ground connection with the spark plug and spark plug shield.

8. In an ignition system, a grounded metal chamber, a generator enclosed in said chamber and including a high tension source neither terminal of which is grounded, a grounded spark plug, a shielding cap on said spark plug having electrical contact with the grounded portion of the spark plug but insulated from the central electrode of the said plug, a high-tension wire connecting one terminal of the high tension source with the central electrode of the spark plug and having a double cover of metal braid shielding, with the inner shielding connected to the other terminal of the high tension source at one end and to the spark plug shielding cap at the other end and the outer shielding connected to the grounded container at one end and to the spark plug and spark plug shielding cap at the other end and substantially at the point where the said cap has ground connection with said plug, said inner and outer shielding being insulated from each other and from the high-tension wire at all points except at the ground connection with the spark plug.

9. In a shielded ignition system, a grounded metal chamber, a grounded spark plug, a generator enclosed in said chamber and including a high-tension source neither terminal of which is grounded, a high tension lead from one terminal of the high tension source to said spark plug having a double metal braid covering providing inner and outer shields, the inner shield being

connected to the other terminal of the high-tension source at one end and being grounded through the spark plug at the other end to provide a path for the return of the ignition current, and the outer shield being connected with the grounded chamber at one end and attached to the inner shield at its other end to have a common ground therewith through the spark plug, said inner and outer shields being insulated from each other and from the high-tension lead at all points except at the ground connection with the spark plug.

10. In a shielded ignition system, an encased high-tension magneto having the secondary high-tension source ungrounded within the magneto casing, a grounded spark plug and a high-tension cable consisting of a high-tension wire connecting one terminal of the secondary high-tension source with the central electrode of the spark plug and enclosed in a metal braid shielding connected to the other terminal of the secondary high tension source at one end and to a grounded portion of the said spark plug at the other end to provide a return path for the ignition current.

11. In combination with an electric circuit having a supply line and a return line electrically insulated therefrom and a receiving instrument electrically connected between said lines, the return line being grounded only at one end and being so disposed with respect to the supply line that the magnetic field of the one is neutralized by that of the other, of shielding means enclosing said circuit and being both electrically insulated therefrom and grounded substantially throughout its length to prevent electrostatic disturbances thereof.

12. In combination with an electric circuit having a supply line and a return line, the one line being enclosed by the other and electrically insulated therefrom and the said other line being

grounded only at one end, of shielding means enclosing said lines and being both electrically insulated therefrom and grounded substantially throughout their entire length to prevent electrostatic disturbances thereof.

13. An electric ignition system having a high-tension source neither terminal of which is grounded, a spark plug, supply and return leads connecting corresponding terminals of the high-tension source and spark plug, said leads being electrically insulated from one another and arranged to neutralize the magnetic field of one by the other, and a metallic shield substantially enclosing said leads and spark plug and electrically connected with the spark plug directly around the point where the return lead connects to the spark plug but being both electrically insulated from said leads at all points except at the connection to the spark plug and grounded at said connection and throughout the length thereof.

14. An electric ignition system comprising a grounded shielding chamber, a non-grounded source of electrical energy within and insulated from said grounded shielding chamber, a grounded spark plug, supply and return leads connecting corresponding poles of said electric source and spark plug, said leads being electrically insulated from one another and arranged to neutralize the magnetic field of the one by the other, and a metallic shield substantially enclosing said leads and electrically connected with the grounded shielding chamber at one end and electrically connected with the return lead and with the said spark plug at the other end, said shield being both electrically insulated from said leads at all points except at the said connection with the return lead and spark plug and grounded throughout the length thereof.

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