

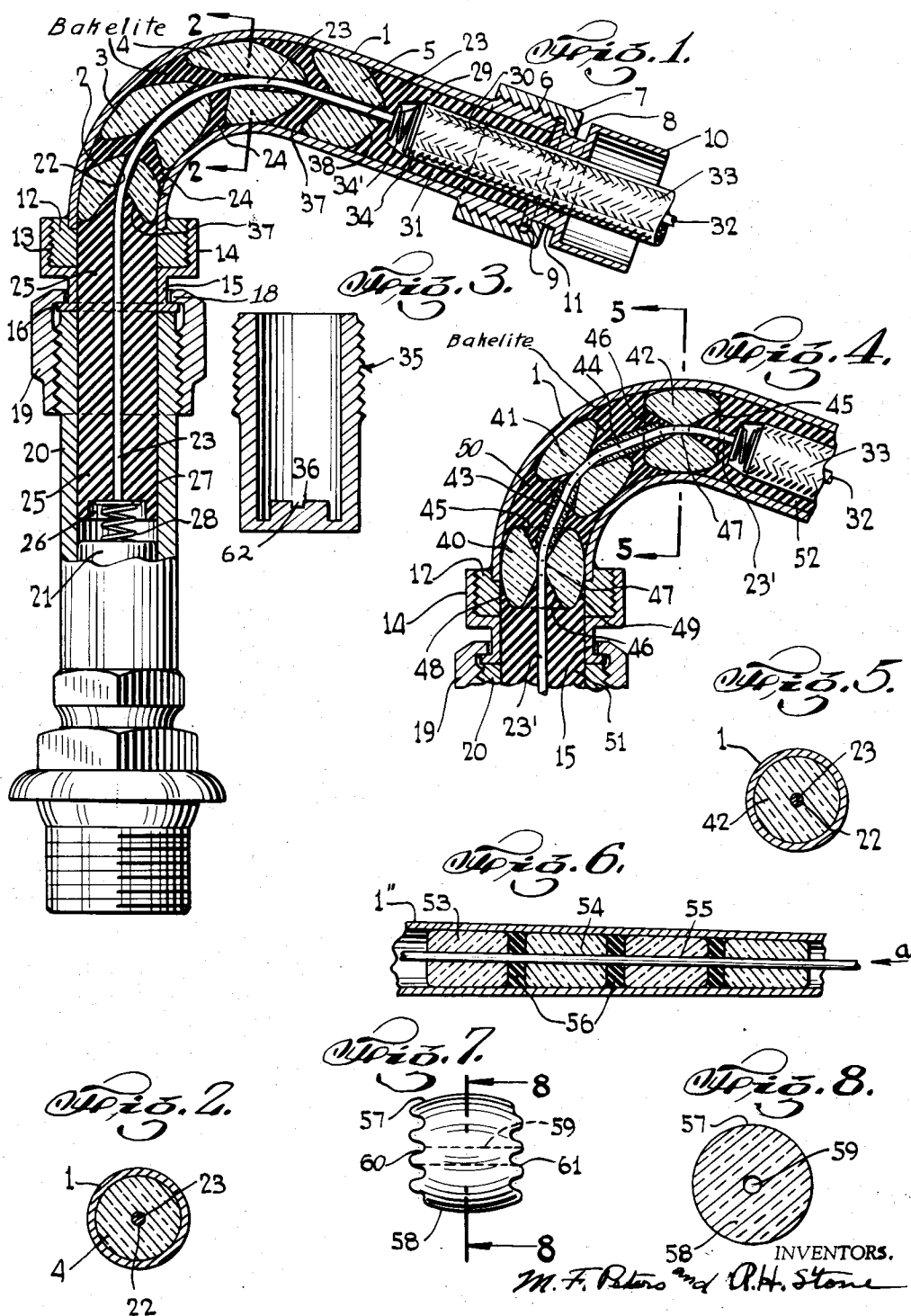
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METHOD FOR MAKING RADIO SHIELDED CONDUCTORS

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METHOD FOR MAKING RADIO SHIELDED CONDUCTORS

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1 Claim. (Cl. 173-244)

This invention relates to the insulation of an electric conductor in a metal tube or conduit, and is particularly applicable to the insulation of an engine ignition conductor within a radio shielding conduit but is useful in other applications.

Ordinarily the spark plug lead comprising the conductor and shielding conduit is bent or curved where it approaches the spark plug, forming what is commonly known as the "elbow." The invention is particularly applicable to the proper location and insulation of the conductor within the "elbow."

It is one of the main objects of the present invention to provide for properly locating and insulating an electric conductor in a metal conduit.

A further object of the invention is to provide for properly locating and insulating an electric conductor in a curved or bent metal conduit.

A further object of the invention is to provide an improved method for locating an electric conductor in a metal conduit where insulation is moulded about the conductor in the conduit.

A further object of the invention is to provide an improved method for locating an electric conductor in a metal conduit where a phenolic condensation product such as insulation requiring pressure treatment is moulded about the conductor, the locating means permitting the application of the necessary pressure to the insulating material.

A further object of the invention is to provide an improved method for locating an electric conductor in a metal conduit where "Bakelite" is moulded about the conductor, the locating means permitting the application of the necessary pressure to the "Bakelite."

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawing which illustrates the invention:

Fig. 1 is a side elevation, partly in central longitudinal section, of a spark plug with an "elbow" formed according to the invention, operatively related thereto;

Fig. 2 is a transverse section on the line 2-2 of Fig. 1;

Fig. 3 is an axial section of a part to be substituted for the spark plug shield when the "Bakelite" in the "elbow" is being moulded therein;

Fig. 4 is a side elevation and axial section, of an "elbow", partly broken away, having a modified form of insulator;

Fig. 5 is a transverse section on the line 5-5 of Fig. 4;

Fig. 6 is an axial section, partly broken away, of a modified form of conduit and insulator;

Fig. 7 is a central longitudinal section of a modified form of insulator; and

Fig. 8 is a section on the line 8-8 of Fig. 7.

Referring to the drawings, and first to Figs. 1, 2 and 3, the device comprises a curved or bent metal tube or conduit 1 within which are the preformed insulators 2, 3, 4 and 5 which may be made of pre-moulded "Bakelite" or porcelain, particularly a steatite porcelain, and they might be of other insulating materials adapted to withstand the heat and pressure to which they are subjected. These insulators have an easy fit in the tube 1 so that they may have a piston-like sliding therein.

At one end the conduit 1 is provided with screw-threads 6 in engagement with the threads on the nut 7 having a flange 8 overlapping the flange 9 secured to the ferrule 10 by a neck 11. In the ferrule 10 is secured the conduit for the ignition lead which extends to form connection with the magneto either through a manifold or not as may be desired. At its other end the conduit 1 is secured by welding, soldering, brazing or in other suitable ways to a terminal body 12 having screw-threads 13 engaging with screw-threads upon the nut 14 having a neck 15 and a flange 16 which is overlapped by a flange 18 on the nut 19 which is in screw-threaded engagement with the tubular metal shield 20 for the spark plug 21, the nut 19 serving to clamp the flange 16 tightly against the end of the shield 20. The spark plug and its shield are of well-known construction and need not be further described.

The insulators 2, 3, 4 and 5 are spaced along the curve of the conduit 1 so they at no time come into contact. Passing through central openings as 22 in the insulators 2, 3, 4 and 5 is an electric conductor 23, such as a copper wire, and between the insulators 2, 3, 4 and 5, "Bakelite" 24 is moulded about the conductor and fills the space between adjacent insulators and between the conductor 23 and the enclosing conduit. Also between the insulator 2 and the spark plug is a body of moulded "Bakelite" 25 through which the conductor 23 passes.

Within the recess 26 in the end of the body of "Bakelite" is a terminal metal plate 27 to which the end of the conductor 23 is secured by welding, soldering, brazing or in any other suitable way, and a metal spring 28 secured in conducting relation to the plate 27 bears upon the central electrode of the spark plug 21.

At the other end of the conductor 23 it is secured by welding, brazing or soldering or in any other suitable way to a terminal plate 29 in the recess 30 of the body of moulded "Bakelite" 31 extending from the insulator 5 to the end of the conduit 1. Extending into the recess 30 is the conductor 32 covered with insulation 33, the conductor 32 being secured to and in conducting relation with the copper washer or plate 34 bearing against the end of the insulation 33,

and a metal spring 34' which establishes contact between the conductor 32, and the conductor 23 is secured to the plate 34 by welding, brazing, soldering or in other suitable ways and bears resiliently against the terminal plate 29.

In forming the "elbow" the member 35 is secured to the end of the conduit instead of the spark plug shielding tube 20. Within this member 35 and within the nut 14 is then placed the "Bakelite" in condition for moulding, usually in powdered form, surrounding the conductor 23.

It will be observed that the bottom of the member 35 is provided with the internal boss 36 to form the recess 26 in the moulded "Bakelite," the boss having a central recess 62 to receive and position the end of the conductor 23. Above the powdered "Bakelite" within the conduit is placed the insulator 2 through which the conductor is threaded, more "Bakelite" to be moulded is then placed within the conduit. The insulator 3 is then placed in position, more "Bakelite" is then added above the insulator 3. The insulator 4 threaded on the conductor is then placed in position and "Bakelite" to be moulded is then placed in the conduit against the insulator 4 threaded on the conductor after which the insulator 5 is placed in position. The "Bakelite" material to be moulded is then placed in the conduit so as to substantially fill the conduit from the insulator 5 to the end of the conduit. The well-known requisite pressure and heat for moulding the "Bakelite" is then applied, the pressure being applied by exerting it against the end of the "Bakelite" at the end of the conduit adjacent the ferrule 10. This will exert pressure successively upon the adjacent "Bakelite" material which will transmit pressure to the insulator 5 which can slide in the conduit and will thus transmit its pressure through the intervening "Bakelite" to the insulator 4, which likewise is slidable in the conduit and transmits its pressure across the intervening "Bakelite" to the insulator 3 which is also slidable in the tube and transmits its pressure across the intervening "Bakelite" to the insulator 2 which likewise is slidable in the conduit and consequently transmits its pressure to the "Bakelite" between the insulator 2 and the end of the member 35.

The well-known heat and pressure treatment having been given, the "Bakelite" as described will have been moulded about the conductor 23 and between the insulators 2, 3, 4 and 5. The member 35 being then detached, the terminal plate 27 may be secured to the conductor 23 as described.

Also the body of "Bakelite" 31 may be bored out to form the recess 30 when the terminal plate 29 may be secured to the end of the conductor 23 as before described.

The end of the "elbow" may now be secured to the spark plug shield 20, the body of "Bakelite" telescoping within the spark plug shield and the whole assembled as above described and as shown in Fig. 1 of the drawing. The insulated conductor 32-33 is tightly gripped within the neck 11 so that it is held in position to engage in conducting relation with the terminal plate 29 through the spring 34'.

It is to be observed that the conductor, by reason of passing through the insulators 2, 3, 4 and 5, is held suitably spaced from the conduit on the curve and elsewhere by such insulators before the "Bakelite" has been moulded into a solid integral insulator, and that by reason of the sliding of the insulators 2, 3, 4 and 5 in the conduit,

pressure may be applied to all parts of the "Bakelite" as is necessary to its moulding. The insulators 2, 3, 4 and 5 insure the proper spacing of the conductor 23 from the metal conduit at all times.

It is further to be observed that each of the insulators has a cone-shaped recess 37 on one side and a cone-shaped projection as 38 on the other side. The distance along the surface of each of these insulators from the conductor to the conduit is much greater than the radial distance of the conductor from the conduit. This is of importance in insuring the insulation of the conductor as there is a tendency for the electricity to creep along the surface of an insulator from a conductor so that such surface is frequently referred to as "creepage" surface, and by lengthening the distance of such creepage the insulation is rendered more secure.

Referring now to the modified structure as shown in Figs. 4 and 5, this is the same in all respects as that shown in Fig. 1 except that each of the insulators 40, 41 and 42 is of a different formation from the insulators 2, 3, 4 and 5 of Fig. 1, and the conductor 23' is surrounded between the insulators with tubes 43 and 44 of high insulation.

It will be seen that in each of the insulators there is a conical recess 45 on one side and similar recess 46 on the other side, the conductor 23' passing through an orifice 47 in the insulator. Also the outer surfaces 48 and 49 of the insulators where they bear against the conduit, are longitudinally curved as shown. It will be observed that this construction provides a long creepage surface from the conductor to the metal conduit and that the insulator may readily adjust itself in moving along the conduit.

The tubes 43 and 44 are of a very high insulating material such as porcelain, preferably steatite porcelain, and extend within the recesses of adjacent insulators as shown, there being, however, sufficient clearance between the ends of each tube and their adjacent insulators so that the tubes will not act to prevent the piston-like insulators from moving along the conduit or exerting the pressure necessary upon the intervening insulating material being moulded.

It will be observed that the insulating tube, by reason of its high insulating properties, will operate to more securely insulate the conductor and increase the creepage surface between the conductor and the conduit over high insulation. The structure of Fig. 4 comprises the moulded insulation, such as "Bakelite" 50, between adjacent insulators and the bodies 51 and 52 of moulded insulation, such as "Bakelite," at its ends as described in connection with Fig. 1.

Referring to Fig. 6 there is therein shown a tapered metal conduit 1" within which are the high insulation, such as steatite porcelain, pre-formed beads 53, 54, 55, etc., there being between adjacent beads the moulded insulating material as 56, such as "Bakelite." The pressure in moulding the "Bakelite" would be in the direction as indicated by the arrow α , and the tapering of the conduit facilitates the sliding of the preformed insulators therealong under the applied pressure as the movement of the insulators along the conduit surface causes a looser fit of the insulators within the conduit and so contributes to their ease in sliding therealong.

Referring to Figs. 7 and 8 there is therein shown a modified form of pre-formed insulator for insertion in the conduit, such insulator hav-

ing its surfaces 57 and 58 presented to the conduit walls, longitudinally curved as shown, has a central aperture 59 for the passage of the conductor, while its faces 60 and 61, separated longitudinally of the conduit are corrugated as shown. This provides a strong and reliable form of insulator and with a long creepage surface from the conductor to the conduit.

While the invention has been illustrated in what are considered its best applications it may have other embodiments without departing from its spirit and is not therefore limited to the structures shown in the drawing.

What we claim is:

The method of insulating a conductor contained in a metal tube which consists in spacing the conductor from the tube by spaced pre-formed insulators, said insulators being out of contact with each other, with insulation between them, said insulation requiring pressure and heat for its molding, the said insulators being slidable in said tube, and subjecting the insulators and insulation to pressure longitudinally of the tube and to heat.

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