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D. INGALLS

2,420,138

LEAD-IN DEVICE FOR MANIFOLD OF IGNITION HARNESS

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Fig. 1.

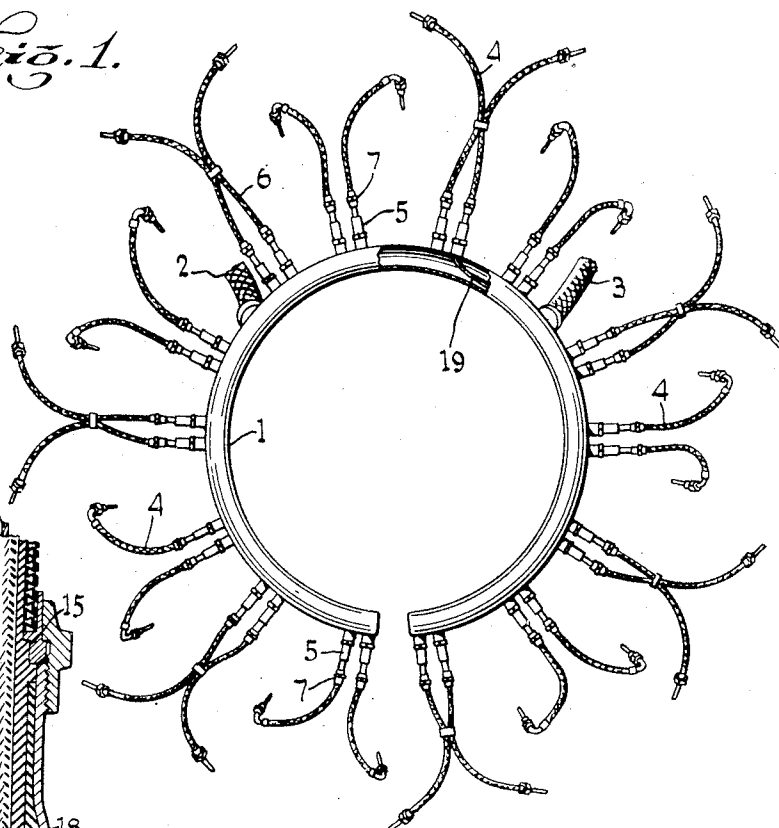


Fig. 2.

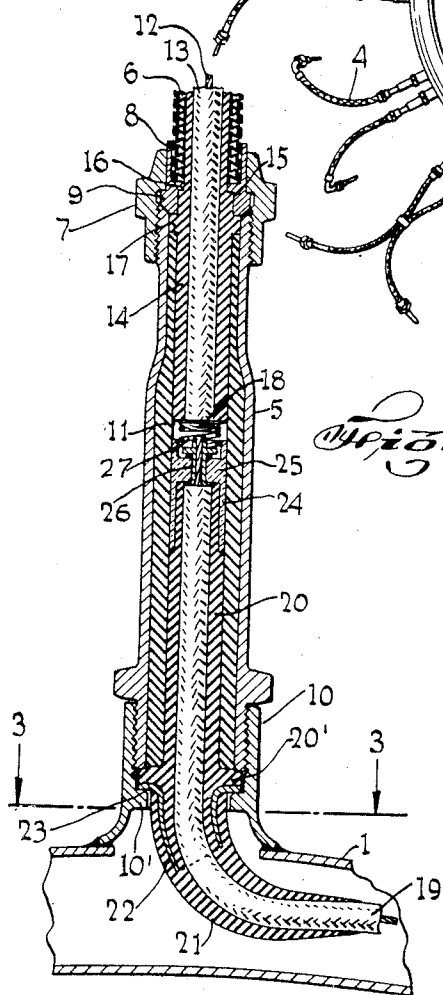
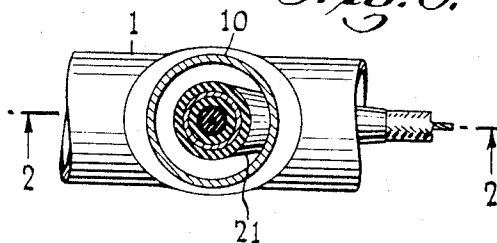


Fig. 3.



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LEAD-IN DEVICE FOR MANIFOLD OF
IGNITION HARNESS

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This invention relates to the support and insulation of electrical cables in tubes where such cables bend to pass out of outlets in the walls of the tubes. Especially, the invention relates to the support and insulation of the ignition cables of internal combustion engines where they bend outwardly to pass from the manifold to the spark plug leads of a radio shielding harness, but is not limited to such applications.

Where the manifold cable bends and passes through an opening thereof to connect with the spark plug, it is important that the cable should be firmly held so as not to rub against the edge of the manifold opening or other parts and should be held firmly in position with relation to other cables and parts, in a suitably insulated manner.

It is one of the objects of the present invention to provide means for accomplishing the results as indicated and not only in ignition harnesses but in any construction where an electric cable within a casing bends and passes outwardly through an opening therein.

A further object of the invention is to provide an improved bushing for mounting on a tube, such as a radio shielding ignition manifold, for supporting, in a suitably insulating manner, an electric cable adjacent to the opening in the tube through which the cable passes.

A further object of the invention is to provide means for drawing off and dissipating deleterious electrical potentials and stresses from bends in electric cables.

A further object of the invention is to provide an improved terminal structure, especially adapted to cooperate with a detachable, radio-shielded, spark plug lead, for a manifold cable in a radio-shielded, ignition harness for an internal combustion engine.

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawings which illustrate the invention:

Fig. 1 is a front elevation of a radio-shielded ignition harness for an internal combustion engine, embodying the invention, partly broken away and with some parts omitted;

Fig. 2 is a section on the line 2—2 of Fig. 3, on an enlarged scale, showing the terminal arrangements of a manifold cable, and of a detachable, radio shielded, spark plug lead cooperating therewith, of the apparatus of Fig. 1, parts being broken away and omitted.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Referring to the drawings, the usual radio

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shielded harness for the ignition of a radial internal combustion engine, such as is used on aeroplanes, as shown in Fig. 1 comprises the tubular metal manifold 1 which receives the ignition conductors from the magnetos through the flexible metal conduits 2 and 3 in a manner well understood. The manifold is arc-shaped as shown so as to embrace the engine shaft and radiating from it are flexible spark plug leads 4, each including a flexible radio shielding conduit and a conductor establishing connection between a conductor in the manifold and a spark plug.

The structure whereby each of the spark plug leads is secured to the manifold and the conductors of the lead and manifold are supported and connected, is shown in Figs. 2 and 3 and comprises a metal sleeve 5 secured at one end to the flexible metal tube 6 of the spark plug lead by means of a nut 7 swiveled about the ferrule 8 in which the tube 6 is soldered, the nut engaging with a flange 9 on the ferrule and being screw-threaded to the sleeve 5. The other end of the sleeve 5 is screw-threaded to the interior of the circular metal outlet 10 fixed upon the manifold and having the internal flange 10'. The metal sleeve 5 has an insulating lining sleeve 11 of molded phenol-formaldehyde condensation resin or other suitable insulating material. Telescoping within the sleeve 11 is a projection from the spark plug lead, such projection comprising the stranded conductor 12 and the insulation 13 thereon, constituting the spark plug lead cable, and the sleeve 14 surrounding the spark plug cable. The sleeve 14 is of suitable molded insulating material, such as a rubber compound as used for insulating wires, and is an integral extension of such material molded in the spark plug lead conduit about the cable. The sleeve 14 also has the shoulder 15 against which bears the flange 16 of the ferrule 8. The sleeve 14 also has the flange 17 against one side of which bears the end of ferrule 8 and the other side of which bears against the end of the insulating lining 11 so that on screwing the nut 7 down on the sleeve 5 the ferrule 8 with its connected tube 6 will be tightly secured against the end of the sleeve 5 and the flange 17 will be tightly pressed against the end of the sleeve 11.

At the end of the spark plug lead cable is a terminal 18 electrically and mechanically secured to the end of the cable conductor.

The manifold conductor cable 19, comprising the usual stranded conductor with a covering of insulation, curves outwardly from its circum-

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ferential manifold position through the outlet 10 into a substantially radial position, to engage the spark plug conductor. Tightly surrounding the end of the cable 19 is a bushing comprising the straight portion 20, the flange 20' and the longitudinally tapered elbow portion 21 about the cable at its bend. The bushing is of suitable insulating material such as a rubber compound as used for insulating wires and the elbow portion is premolded into the form which it occupies in the completed structure as shown so that in use it will be in normal relaxed condition, without being under any bending stress, whereby its dielectric properties are greatly improved.

A metal thimble comprising the curved tubular portion 22 and having the flange 23, has the portion 22 embedded in the elbow portion while the flange 23 is exposed beneath the flange 20'. It will be observed that the wall of the portion 22 is longitudinally tapered in thickness.

When the sleeve 5 is sufficiently screwed into the outlet socket 10 and the nut 7 is screwed down tightly on the sleeve 5, the sleeves 11 and 5 press against the flange 20' thereby compressing the flange 20' and forcing the metal flange 23 against the metal flange 10' metallicly connected with the manifold which is grounded on the engine block.

At the outer end of the sleeve 20 is fitted a tubular insulator 24 of ceramic material or mica-lead borate material having a partition 25 in which is mounted a metallic bushing 26 to which the conductor of the cable 19 is electrically and mechanically connected as by soldering. Also electrically and mechanically secured to the bushing 26 is a spring 27 which, when the parts are assembled as shown in Fig. 2, bears against and makes electrical contact with the terminal 18 thus connecting together the conductors of the spark plug lead and manifold cables. This connection may be broken and the lead detached from the manifold by unscrewing the nut 7 and withdrawing the sleeve 14 and its enclosed cable and the terminal 18.

The collar formed of the flanges 23 and 20' has the functions that the flange 20' seals the threaded assembly of the detachable lead body and outlet against the entrance of moisture, and the flange 23 connects with ground parts at and adjacent the bend in the bushing and cable thereby draining off potentials tending to accumulate and which might injuriously affect the structure.

The longitudinal tapering of the tubular portion 22 of the thimble provides for tapering off the concentration of electrical stress to the point of the manifold connection.

The thimble also reinforces the elbow 21 whereby the cable bend is securely and firmly held in position whereby its relationship to the other

conductors and parts is not changed and the cable is held from wearing against adjacent parts of the manifold or other nearby parts.

While the invention has been illustrated in what is considered its best application, it may have other embodiments without departing from its spirit and is not therefore limited to the structure shown in the drawings.

What I claim is:

1. The combination with the manifold of a radio shielded ignition harness for an internal combustion engine, of a cable therein, said manifold having an outlet and said cable being bent to pass through said outlet and an elbow about said cable at its bend, said elbow being of pre-molded insulation and conducting means associated therewith, said elbow having a flange and means for clamping said flange to said manifold and said conducting means in electrical connection with said manifold, said conducting means being embedded in said insulation throughout at least part of the radius of bend of the elbow but in part exposed.

2. The combination with the manifold of a radio shielded ignition harness for an internal combustion engine, of a cable therein, said manifold having an outlet and said cable being bent to pass through said outlet, an elbow about said cable at its bend, said elbow being of premolded insulation with conducting means embedded therein, said elbow having a collar comprising a flange of insulation and an exposed conducting flange of the conducting means embedded in said insulation, said elbow being longitudinally tapered, said conducting means being longitudinally tapered and extending throughout at least a part of the radius of bend of said elbow and means for clamping said collar to said manifold with the said conducting flange in electrical connection with said manifold.

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