June 23, 1942. E. A. ROBERTSON 2,287,134

SHIELDED IGNITION MANIFOLD SYSTEM

Filed Aug. 10, 1935

Fig. 2.

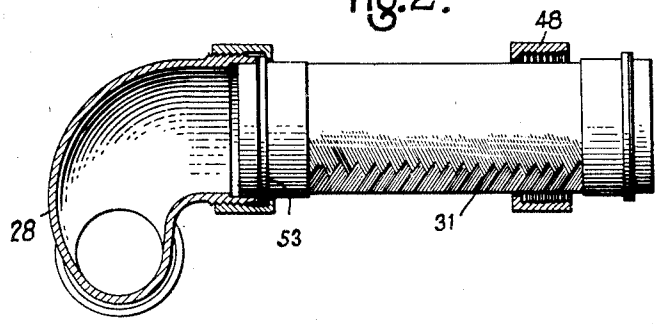


Fig. 3.

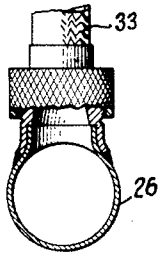


Fig. 1.

Fig. 4.

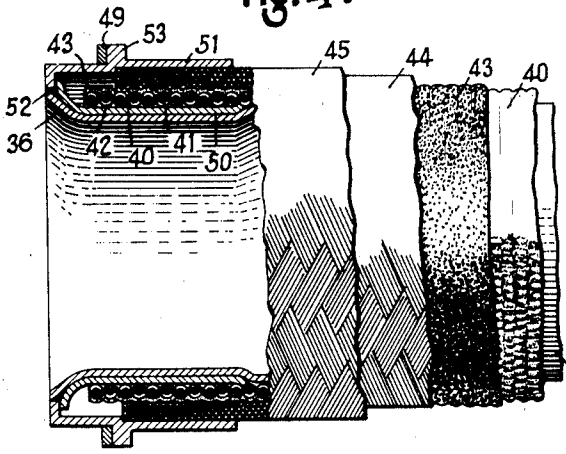
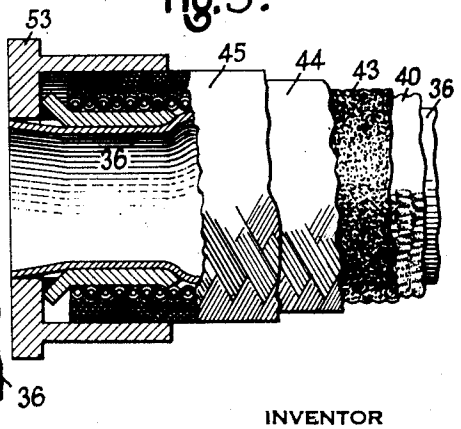


Fig. 5.



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SHIELDED IGNITION MANIFOLD SYSTEM

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Application August 10, 1935, Serial No. 35,683

3 Claims. (Cl. 174—74)

This invention relates to ignition manifolds for internal combustion motors and has for a general object the provision of improvements in this art.

More particularly the invention relates to a manifold of the pull-in type which is shielded to prevent disturbance with radio reception by stray currents from the ignition wires housed therein.

Among the more specific objects of the invention are the provision of a manifold which can be readily assembled on a motor, for example, on an airship where space about the motor is very limited; which permits the insulated ignition wires to be pulled in easily and without injury to the insulating covering; which includes improved flexible sections which will hold their cross-sectional shape even when bent and prevent the opening up of braided metal shielding placed thereon; and which in other respects constitutes an advance in the art.

The invention may be more readily understood by reference to the accompanying drawing of an illustrative embodiment thereof wherein:

Fig. 1 is an elevation view, partly in section and with parts broken away, showing a portion of a manifold embodying the present invention;

Fig. 2 is a section, partly in elevation taken on the line 2—2 of Fig. 1;

Fig. 3 is a section taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged section, partly in elevation, of one end of a flexible trunk member; and

Fig. 5 is a similar view of a flexible branch member.

Referring to the drawing, there is shown in Fig. 1 a manifold assembly—sometimes referred to as harness—which comprises some rigid sections and some flexible sections. Herein there are shown the curved rigid trunk sections 26, 27 united by the T-coupling 28. The manifold assembly is preferably connected with a magneto (not shown) by the flexible tube 31. The assembly is connected with suitable parts at the spark plugs by flexible tubes 33.

Thus broadly, there is seen to be provided a manifold having a number of separable parts which are so designed as to permit the convenient assembly thereof upon the motor as well as the convenient insertion therein of the insulated conductors.

The rigid tubular sections 26, 27, may be formed of any suitable metal which is a good electrical conductor and which has good abrasion resisting qualities. For example, a brass tube plated on the outside with cadmium has been found to be satisfactory.

At the points where the conductors emerge for the spark plugs (Figs. 1 and 3) the tube is pierced and pushed outward in smooth curvature to form nipples 34 over which the union fittings 35 are secured, as by soldering. It will be seen that the end of the nipples are disposed well back within an annular recess of the shell of the fitting 35 where they will not interfere with or injure the insulated conductors 30 when the latter are drawn therethrough.

In order to avoid excessive corona discharge and capacitance loss between the metal tube and the conductors it may be desirable to line the manifold with insulating material. Rubber may be used and one method of applying it which has given good results is to place a lining tube within the metal tube, expand it by pressure and cement it in place; or the rubber may be applied by a plating process. Another method which has proved satisfactory is to heat a cellulose tube—as, for example, by soaking it in hot water—until it softens somewhat, then to force it into the metal tube and allow it to reharden in place. Such an insulating liner 36 is shown in Figs. 4 and 5. It may also be placed in the rigid metal members and couplings if desired.

For the sections which need to be flexible there is hereby provided a construction which insures that the cross-sectional shape will remain substantially constant. In the embodiment shown in Figs. 4 and 5 this construction includes a semi-flexible inner loom tube 40 which has considerable strength against crushing. It may be formed by braiding a metal wire 41 such as steel or bronze with fibrous strands 42. The metal wire may run spirally to secure maximum rigidity. This tube may be impregnated with a material such as rubber or the like and may have a coat 43 of the same or similar material on the outside to exclude water, oil and gasoline from the group of conductors inside. Upon this loom tube is braided the radio shielding jacket. This jacket may comprise a closely woven inner braid 44 of copper or other material which is a good electrical conductor and an outer braid 45 of an abrasion-resisting material such as stainless steel. The combination of the loom tube of metal and fibrous strands and the metal shielding braid thereover is believed to have distinct advantages in that the braid can be wrapped tightly on the loom tube and the assembly can be bent freely without collapsing or changing in cross-sectional shape materially. This obviates the opening up of the

shielding braid. The resilient coating **43** permits the braid to embed itself and assists in avoiding slippage and opening up of the braid. Unless the braid covers substantially the entire surface without openings it will not form a satisfactory shielding.

Instead of using the loom tube for a foundation there may be substituted one of the known types of spiral metal hose with sealed joints but in this case also there should be provided between the hose and the metal braid a coating of rubber or similar material which will not slip on the tube and in which the braid can embed itself to prevent its slipping and bunching and leaving open spaces when the assembly is flexed. Also an insulating liner may be used on the inside.

Couplings are provided at all joints permitting rapid assembly and removal. The rigid metal sections (Fig. 1) are provided with flanged collars **47** preferably sweated on with silver solder. The mating part is recessed interiorly to receive the end of the collar and is threaded exteriorly to take a coupling nut **48**. A metal gasket **49** (of lead or the like) is provided to make a tight joint and establish electrical continuity between the connected parts. Similar metal gaskets are provided at all joints.

The couplings at the ends of the flexible sections also serve to hold the several concentric layers of material tightly together. The coupling for the trunk section is shown in Fig. 4 and for the branches in Fig. 5. They are not identical but correspond in the number and function of parts so the description of one will serve for both. An inner ferrule **50** and an outer ferrule **51** are placed on the inside and outside respectively of the tube assembly. The inner ferrule is then expanded, as by a boiler tube expander, to grip the tube assembly between itself and the outer ferrule. The ferrules are then secured and sealed together at their outer ends by solder as shown at **52**. The inner ferrule is flared at the outer end to provide easy threading of the insulated conductors through the manifold. It is also flared out at its inner end to obviate having abrasive edges. The outer ferrules are provided with flanges **53** for cooperating with the nuts **48** for joining the sections.

At intervals the manifold sections are secured to the motor by suitable brackets. These also serve to ground the manifold assembly, good electrical connections being made through them as by soldering, and prevent the building up of capacitance between the manifold and the metal work of the motor.

The T-coupling 23 is curved in the portion between the opposed open ends to conform to the curvature of the rigid metal tubes. The portion leading to the other opening is offset upward and turned over at an angle. The couplings are made smooth inside by sandblasting or otherwise. Or they may be lined with insulating material such as described above. This permits the insulated conductors to be readily pulled in and neatly disposed without sharp bends and without marring the insulation.

From the foregoing description it will be seen that the present invention provides a convenient and practical assembly which permits quick and easy insertion and removal of the conductors and which is effective from the radio shielding and motor ignition standpoints.

While one embodiment has been described in detail to illustrate the principles of the invention, it will be understood that the invention may be variously altered and embodied within the scope of the subjoined claims.

I claim:

1. A shielding conduit for ignition wires or the like comprising a semi-flexible loom tube of interwoven metal wire and fibrous strands, a covering of yieldable moisture-proof material, such as rubber, surrounding and impregnating said tube, a braided jacket of metallic strips having good electrical conductivity, such as copper, surrounding and partially embedded in said yieldable coating, and a braided jacket of metallic strips, such as steel, having good abrasion-resisting qualities closely surrounding said first-named jacket.

2. A shielding conduit for ignition wires and the like comprising a semi-flexible loom tube of interwoven metal wire and fibrous strands, a covering of yieldable moisture-proof material, such as rubber, surrounding and having interlocking relation with said tube, a pair of superposed braided metallic jackets surrounding said coating, the inner jacket being partially embedded in said coating and having good electrical conductivity and the outer of said jackets having good abrasion-resisting qualities, and a flexible lining of electrical insulating material inside and in close contact with said loom tube.

3. A shielding conduit for ignition wires and the like comprising a semi-flexible loom tube of interwoven metal wire and fibrous strands, a covering of yieldable moisture-proof material, such as rubber, surrounding and having interlocking relation with said tube, a pair of superposed braided metallic jackets surrounding said coating, the inner jacket being partially embedded in said coating and having good electrical conductivity and the outer of said jackets having good abrasion-resisting qualities, and a ferrule in an end of said conduit comprising a rigid metallic sleeve surrounding said end and a metallic sleeve expanded within said end of the conduit to compress the latter between said sleeves, the outer end of said second-named sleeve being flared outwardly and secured to said first-named sleeve, as by soldering.

EDWIN A. ROBERTSON.