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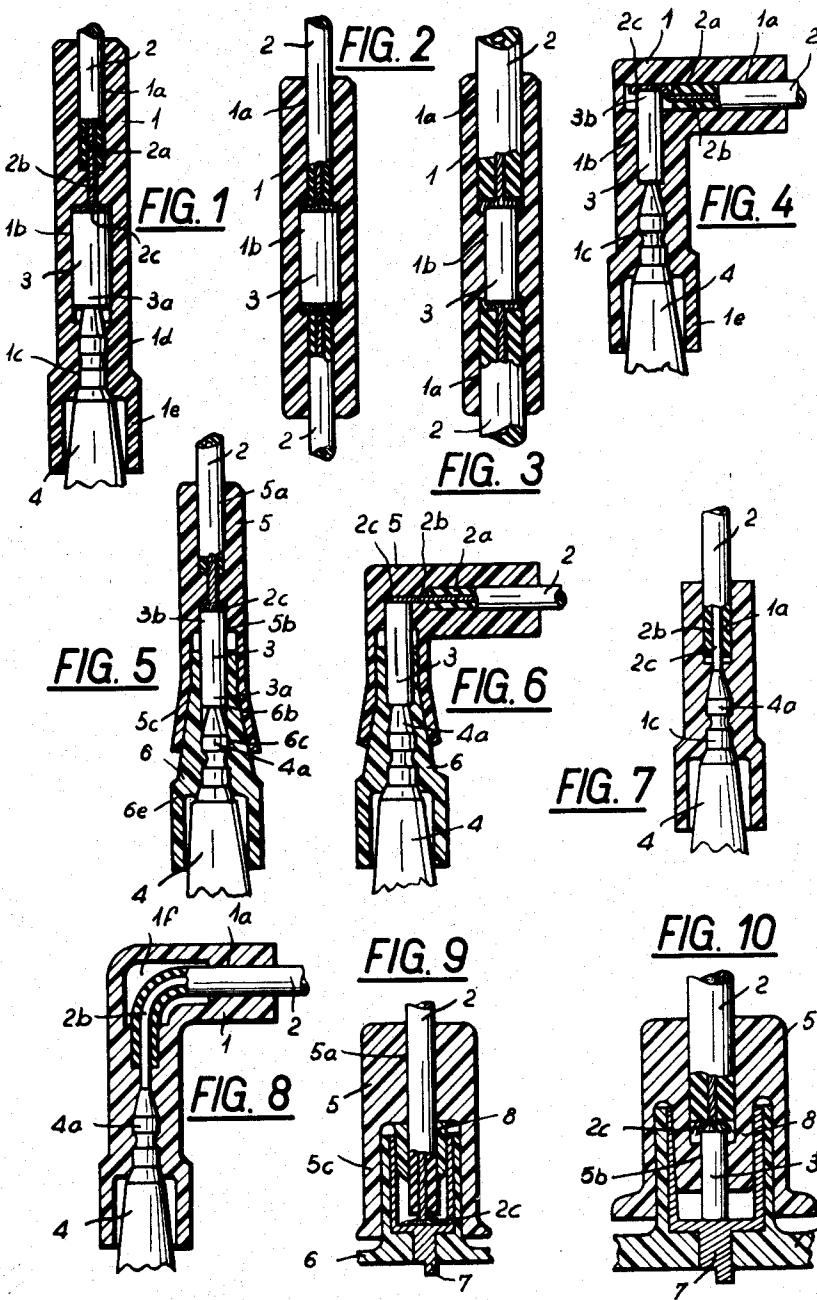
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3,002,126

MECHANICAL MEMBERS CONNECTED TO FORM AN ELECTRICAL CIRCUIT

Filed April 25, 1958

3 Sheets-Sheet 1



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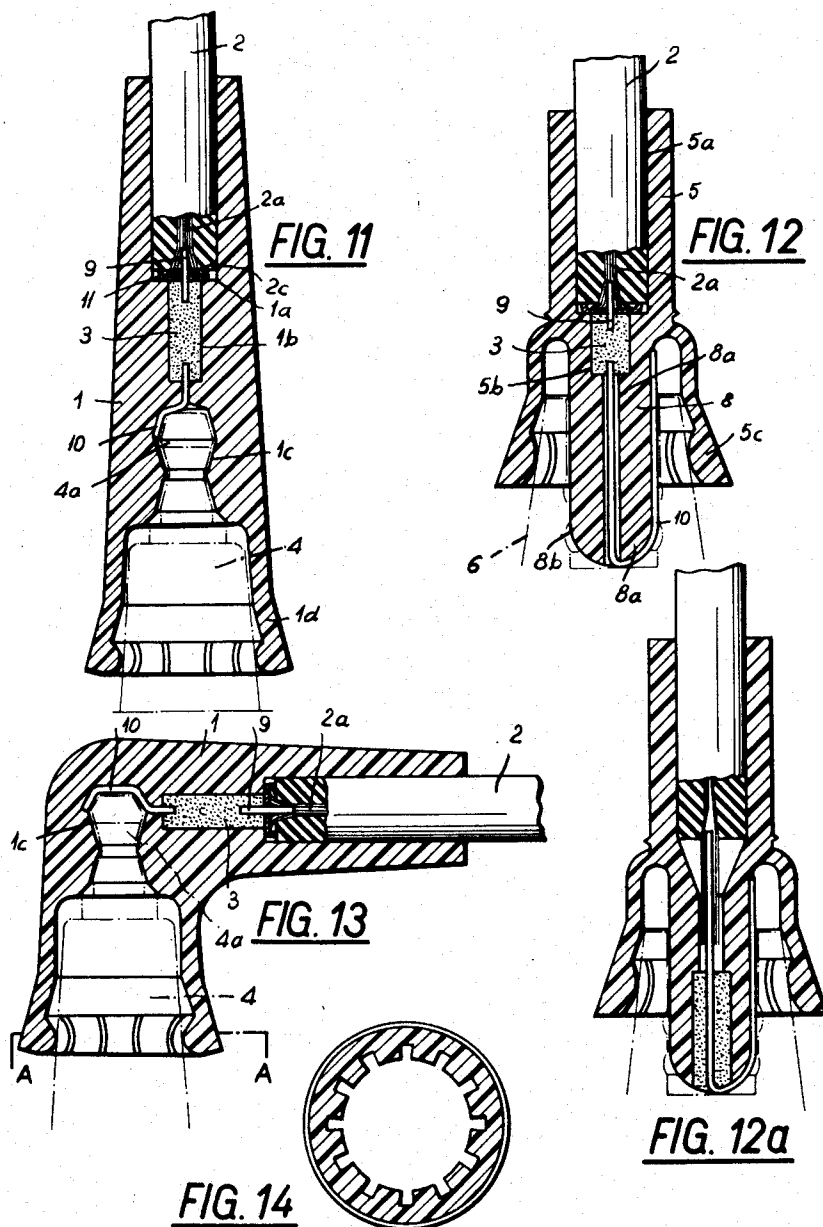
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MECHANICAL MEMBERS CONNECTED TO FORM AN ELECTRICAL CIRCUIT

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3 Sheets-Sheet 2



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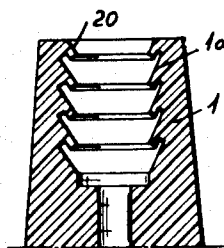
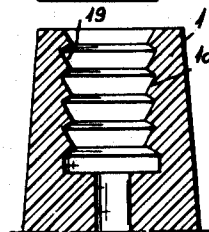
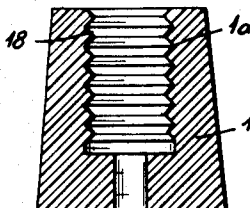
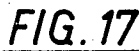
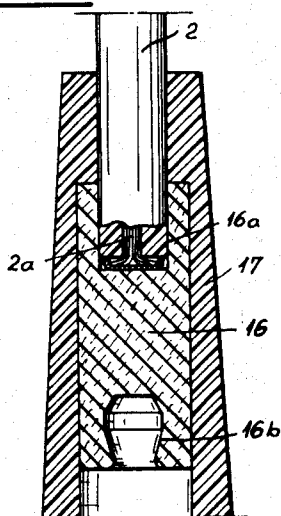
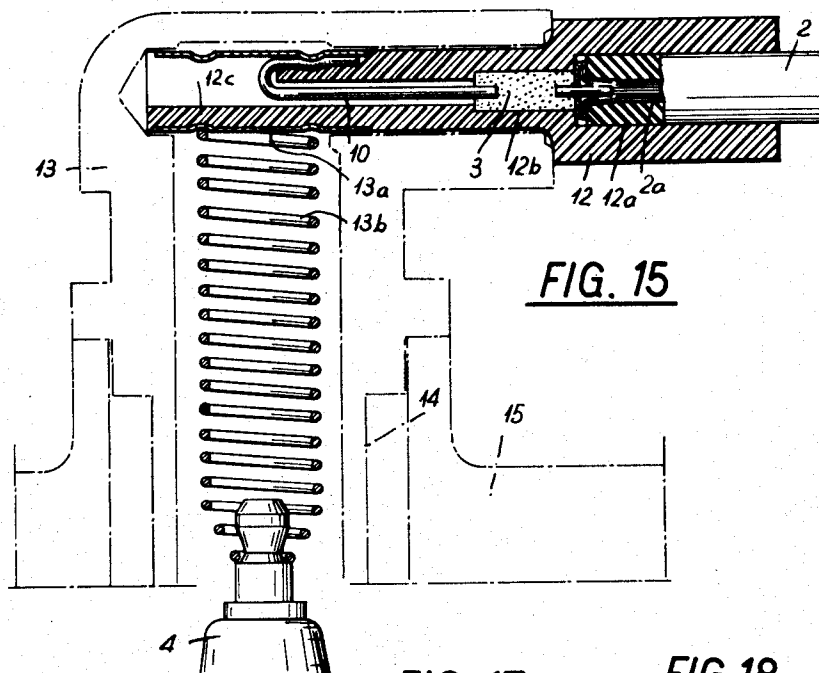
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MECHANICAL MEMBERS CONNECTED TO FORM AN ELECTRICAL CIRCUIT

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3 Sheets-Sheet 3



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3,002,126

MECHANICAL MEMBERS CONNECTED TO FORM AN ELECTRICAL CIRCUIT

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6 Claims. (Cl. 315-58)

This invention relates to a member of an electrical circuit and to the use of the said member in the electrical circuit of an engine. The said member could for instance be part of an anti-strays circuit and be used, especially in this case, in the ignition circuit of motor vehicles in order to inhibit the production by this circuit of strays which may interfere with the reception of radio or television broadcasts.

It is known that, for instance, in order to avoid the production of undesirable strays by the ignition circuit of an engine, one switches in, between the wires connected with the high voltage current generator, blocking pieces for the high voltage oscillation which produces the radiating strayfield.

The said blocking pieces can either be resistances or separate inductance coils or be constituted by the conducting wires themselves.

The member of an electrical circuit according to the invention may comprise electric pieces such as ordinary conducting wires, special conducting wires, resistances, blocking inductance coils, terminals or other connecting members like those of sparking plugs etc.

The said member is characterized in that the said pieces are at least partially elastically clamped on a connecting body made of flexible and elastic material so as to be maintained in connection together.

The connecting body may be made of natural or synthetic rubber for example neoprene or of any other plastic material showing the required properties.

The connecting body may for instance include interconnected recesses the size of which is such that the different pieces to be assembled may be forced therein while deforming the said recesses in order to be clamped into the latter and rigidly maintained in connection together.

The connecting body may be given any convenient shape for example straight or bent; it may be made of several parts joined together preferably by fitting. The recesses are shaped according to the piece for which they are provided so as to insure the required rigidity for their assembly.

The member according to the invention has the important advantage of connecting together mechanically as well as electrically two or more electric pieces without requiring the use of complicated mechanical connecting means.

It may moreover be easily and cheaply produced. It also insures the watertight assembly of the different pieces and the maintenance of their electrical characteristics, namely for the oscillations blocking piece, when in use, while avoiding any shunting of the said piece by eliminating any unevenness which may produce any by-pass of the current.

Finally its dielectric rigidity is excellent in view of the homogeneity of the connecting body; the electrical contacts are maintained permanently under the action of the strain to which the elastic body has been subjected during the assembly of the different pieces whereby a permanent pressure of the latter onto the electrical pieces is produced.

Several embodiments of the invention are shown by

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way of example in the accompanying drawings. In said drawings:

FIGURE 1 is a longitudinal sectional view of a first embodiment of the invention which shows an antistrays member for the ignition circuit of an internal combustion engine.

FIGS. 2 and 3 are similar views of two other embodiments of the invention which are also antistrays members of a circuit.

FIGS. 4 to 8 are similar views of further embodiments of the invention which still are antistrays members for electrical circuits.

FIGS. 9 and 10 are longitudinal sectional views showing members according to the invention comprising a conductor and different electrical pieces.

FIG. 11 is a longitudinal sectional view of a member according to the invention to be used for the antistray connections of the spark plugs of an engine.

FIG. 12 is a similar view of an embodiment of the invention to be adapted on the head of the ignition distributor of an engine.

FIG. 12a is a view similar to FIG. 12 showing a slightly different embodiment of the invention.

FIG. 13 is a view similar to FIG. 11 showing a connecting member of the bent type.

FIG. 14 is a sectional view along lines A—A of FIG. 13.

FIG. 15 is also a view similar to FIG. 11 showing a member according to the invention used for the connection of the ignition wire to a pipe fitted on the hemispherical cylinder head of an engine.

FIG. 16 is an axial section of an embodiment of the invention in which the piece for blocking the oscillations may be used at least partially as an elastic connecting body.

FIGS. 17 to 19 are partial sectional views showing recesses of various shapes for the location therein of a cylindrical conducting piece.

The member shown in FIG. 1 comprises a connecting body 1 made of flexible and elastic material such as synthetic rubber. The said body is provided with several internal interconnected recesses, for instance a first cylindrical recess 1a at one of its ends, a second cylindrical recess 1b in its middle part and a shaped recess 1c at its other end.

The recess 1a contains the end 2a of a high voltage current wire 2. Its natural cross section is smaller than the one of the sleeve of the wire 2a so that the latter is rigidly maintained in the said recess by the elastic restricting force of the thick walls of the connecting body.

The stripped core 2d of wire 2 enters into recess 1b where it opens out in 2c by folding back of the conductor or by knotting of the latter on itself.

The recess 1b contains a blocking piece 3 for high voltage current and has also a smaller section than the blocking piece which, in the present example, has a cylindrical shape. The said piece 3 is forced into the connecting body, which is possible due to the deformability of the material of the connecting body 1. The blocking piece 3 is elastically clamped into recess 1b of the connecting body 1 and therethrough maintained in contact with the folded back conductor 2c.

The recess 1c which is connected with the recess 1b comprises first a shaped part 1d corresponding to the conical point 4a of the spark plug 4 and a skirt 1e which covers partially the insulated body of the said sparking plug.

When this spark plug is put in place in recess 1c, its conical point is elastically pressed against the end 3a of the blocking piece 3 and the contact is perfect.

In the said embodiment three electrical pieces i.e. the conductor 2, the blocking piece 3 and the blocking part

4 are mechanically and electrically connected by means of a single piece of flexible and elastic material which constitutes the connecting body 1. This assembly is perfectly watertight, very resistant and provides the already mentioned advantages.

In FIGS. 2 and 3, the body 1 is connecting two conductors 2 which may be identical or different and a switch in electrical piece 3 such as an oscillations blocking piece. The same recesses 1a and 1b are provided in the connecting body 1 and the electrical connection between the switch in piece and the conductor is maintained in the same manner due to the elastic clamping provided by body 1.

It does not matter whether the central recess is broader or narrower than the terminal recesses.

In FIG. 4, the body 1 is bent; it comprises also a recess 1a with which the central recess 1b is interconnected, the latter being also connected with a recess 1c for the spark plug 4.

In order to assemble the different pieces after forcing into the corresponding recess the end 2a of the conductor 2, the stripped core 2b of which opens out in 2c, one inserts the blocking piece 3 into the recess 1b in order to connect the end 3b of the said piece 3 with the stripped core of conductor 2; finally one caps the spark plug 4 with recess 1c for final connection.

In this case also one single body of elastic matter permits perfect connection of the electrical pieces.

As shown in FIGS. 5 and 6 it is also possible to realize the connecting body in several parts.

On FIG. 5, such a body comprises a first part 5 provided with a recess 5a for conductor 2 at one of its ends. The other end of part 5 is provided with a socket 5c at the bottom of which a recess 5b connected with a further recess 5a is provided; the end 3b of blocking piece 3 is fitted into recess 5b and maintained into contact with the opened out part 2c of the core of the conductor 2.

The second part 6 of the connecting body comprises a shaped recess 6c for the conical point 4a of spark plug 4 and a cap 6a which surrounds the insulated part of the plug 4. A recess 6b for the end 3a of the blocking piece 3 is also provided and may be forced into the socket 5c of the other part. This embodiment is just as suitable as the former one and permits, moreover, an easier assembly of the middle piece 3.

In the embodiment shown in FIG. 6, part 6 is to the corresponding part of FIG. 5, whereas part 5 is bent in a similar way as in the embodiment of FIG. 4.

The connecting body could, of course, comprise more or less than three recesses and be made of more than two parts according to the complexity of the pieces to be connected.

FIGS. 7 and 8 refer to embodiments of anti-strays circuits in which the conducting core 2b of conductor 2 acts itself as a blocking piece.

In the embodiment of FIG. 7 the connecting body 1 is provided only with cavities 1a and 1c which are interconnected, the end 2c of conductor 2, opened out if necessary, being maintained in contact with the conical point 4a of spark plug 4.

In the embodiment shown in FIG. 8, the connecting body 1 is bent and the recess 1a comprises a widened middle part 1f for easing the introduction of conductor 2.

In the embodiment of FIG. 9 the connecting body 1 comprises two parts, one of which numbered 5 is provided with recess 5a, for conductor 2, connected to a socket 5c and the other one 6 fitted into the said socket and containing an electrical piece such as 7 maintained into contact with the opened out end 2c of the core of the conductor. A centering piece 8 is inserted over conductor 2.

The embodiment shown in FIG. 10 comprises a centering body 8 which is an integral part of part 5 and com-

prises a recess 5b for a blocking piece 3 switched in between piece 7 and the opened out end 2c of the core of the conducting cable.

In the embodiment shown in FIG. 11, the connecting body 1 comprises 3 recesses 1a, 1b and 1c respectively for conductor 2, the blocking piece of high voltage oscillations and the conical point 4a of spark plug 4, the latter being partially covered by skirt 1d.

The blocking piece 3 is cylindrical and provided at its both ends with conducting wires 9 and 10.

In order to ensure a perfect electrical contact between piece 3 and the conductor 2, the end of core 2a of the conductor is opened out in 2c and a part of wire 9 is inserted between the strands of the core of the conductor. A small pressed cap 11 is also inserted between piece 3 and the opened out strands 2c.

The connection between piece 3 and the conical point 4a of the spark plug is provided by the bent end of wire 10 which is maintained against the wall of recess 1c said part of the wire being forcibly pressed against the conical piece 4a under the stress provided by the connecting body.

The water-tightness of the connection between skirt 1d and spark plug 4 is enhanced by a ring-shaped bead provided at the lower end of the said skirt.

The embodiment shown in FIG. 12 is provided for being adapted on the head 6f of a distributor; its body comprises a cylindrical recess 5a for the conductor and a recess 5b for the blocking piece 3. It is terminated by a finger 8 provided with a central bore 8a in which a portion of wire 10 is inserted.

The connection between conductor 2 and blocking piece 3 is similar to the one shown in the embodiment in FIG. 11.

The wire 10 is bent outwardly on to the tip 8b of finger 8 in order to ensure the contact with the armature 7a of the head of the distributor by means of the elasticity of finger 8.

In the embodiment shown in FIG. 12a the blocking piece is provided inside the finger 8.

In the embodiment shown in FIG. 13 the body 1 is bent and the wire 10 of the blocking piece 3 is bent toward the bottom of recess 1c provided for the conical point 4a of spark plug 4.

FIG. 15 shows an embodiment of the invention provided for connection of a conductor 2 and a lead in tube 13 for closing up a pit 14 of a cylinder head 15 at the bottom of which a spark plug is mounted. This said spark plug is connected with the socket 13a of the lead-in tube 13 by means of a spring 13b as usually.

The body 12 of this connecting member is provided with cylindrical recesses 12a for conductor 2 and 12b for the blocking piece 3 and with an extension 12c which is maintained elastically into socket 13a, the wire 10 being bent in a U-shaped manner onto the laterally split wall of the extension 12c for being elastically clamped between the said wall and the socket 13a.

The embodiment of FIG. 16 shows the possibility of inserting between the electric piece and the body a blocking piece 16. In this case piece 16 is made of elastic conducting material, for example conducting rubber, and provided with a recess 16a for conductor 2 and a recess 16b for the conical point of the spark plug.

The piece 16 is located in a protecting sleeve 17 which may also be made of elastic material and enhance the clamping on to the conductor and the conical tip of the spark plug.

In a further embodiment of the invention which is part of an antistray-circuit, the connecting body may comprise a conducting section which forms a blocking piece for the oscillations; for example a recess which is made conductive by metallisation or by any other method, and electrically connected at one end to the conductor feeding the electric current required and at the

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other end to the conical tip of the spark plug, located in the terminal recesses.

In the embodiments shown in FIGS. 16 to 19 showing parts of connecting bodies the recesses of the said bodies comprise circular or helicoidal projections for example with a serrate shape as numbered 18 or 19 in FIG. 17 and 18 or projections 20 as shown in FIG. 19 obliquely bent towards the interior of the recess in order to permit an easy introduction of the conductor and interfere with its extraction.

One can consolidate the assembly of the electrical pieces by gluing with a rubber solution or any other convenient adhesive.

The expression "blocking piece" used throughout this specification is directed not only to one which is actually made in one piece but can also be applied to a series of pieces assembled together in parallel or in unparallel series.

What I claim is:

1. A connection between the connecting post of a spark plug and the splayed projecting end of a sheathed wire, comprising a current-filtering element including conductive ends engaging directly and by mere mechanical contact respectively the connecting post and the splayed end of the wire, said conductive ends being independent of said post and wire, and an elastic sheath fitted in direct contact over its entire length and tightly over the interengaging parts constituted by said post, current filtering element and splayed end of the sheathed wire to clamp same under tensioned conditions together in electrically and mechanically contacting relationship.

2. A connection between the connecting post of a spark plug and the splayed projecting end of a sheathed wire, comprising an inductance including conductive ends engaging directly and by mere mechanical contact respectively the connecting post and the splayed end of the wire, said conductive ends being independent of said post and wire, and an elastic directly contacting with and fitted in axially and transversely stretched conditions over the inductance and the cooperating parts of the post and projecting end of the wire and clampingly holding the post, on the one hand, and the splayed end, on the other hand, in tight electrical and mechanical relationship with the corresponding end of the inductance.

3. A connection between the flaring terminal of a spark plug and the splayed projecting end of a sheathed wire, comprising an inductance including conductive ends engaging directly and by mere mechanical contact respectively the flaring terminal and the splayed end of the wire, said conductive ends being independent of said post and wire, and an elastic sheath fitted under tensioned conditions over the inductance and the cooperating portions of the terminal and of the projecting wire end, said sheath including two sections of which one is fitted clampingly over and in direct contact with the outer surface of the flaring terminal of the instrument and the corresponding end of the inductance to urge same into electrical and mechanical contacting relationship and a second section the bore in which clampingly engages the outer surface of the sheathed wire and the cooperating end of the inductance and in direct contact therewith to hold said inductance fast in electrical and mechanical contacting relationship with the splayed end of the wire and with an annular terminal groove inside which are fitted the cooperating terminal portions of the first section and of the flaring terminal of the instrument

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inside the latter to hold said flaring terminal fast in electrical and mechanical contacting relationship with the inductance.

4. A connection between the connecting post of a spark plug and the splayed projecting end of a sheathed wire, comprising a stray-preventing reactance including terminals having a direct and merely mechanically abutting surface contact with the connecting post and with the splayed end of the wire, respectively, while being mechanically independent of said post and wire, and an elastic sheath fitted in overall direct contact with, and tightly under tensioned conditions over the interengaging parts constituted by said post, reactance and splayed end of the sheathed wire to clamp same together in electrically and mechanically contacting relationship.

5. A connection between the connecting post of a spark plug and the splayed projecting end of a sheathed wire, comprising a current-filtered element including at one end a terminal wire facing said spark plug and engaging laterally the end of the latter, the other end of said element having a direct and mechanical surface contact with the splayed end of the wire, said element ends being independent of said post and wire, and an elastic sheath fitted in overall direct contact and tightly over the interengaging parts constituted by said post, current-filtering element and splayed end of the sheathed wire to clamp under tensioned conditions the post over the splayed end and the terminal wire of said element laterally over the end of the spark plug.

6. A connection between the connecting post of a spark plug provided with an annular terminal and the splayed projecting end of a sheathed wire, comprising a stray-preventing resistance including a terminal engaging directly the splayed wire and mechanically independent of the latter, an auxiliary wire mechanically and electrically connected with the end of the resistance facing the annular terminal, lying axially of the latter and including a bent extension terminating in a direction facing back towards last-mentioned end of the resistance and mechanically independent of the annular terminal, an elastic sheath fitted in overall direct contact with and tightly over the sheathed wire, resistance and annular terminal to camp the splayed end of the wire under tensioned conditions into electrical and mechanical contacting relationship over the corresponding end of the resistance and an axial extension of the sheath fitted elastically inside the annular terminal, provided with a longitudinal perforation through which extends the axial auxiliary wire and elastically engaging through its outer surface the extension of the latter to urge same under tensioned conditions into mechanically and electrically contacting relationship with the inside of the annular terminal.

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