

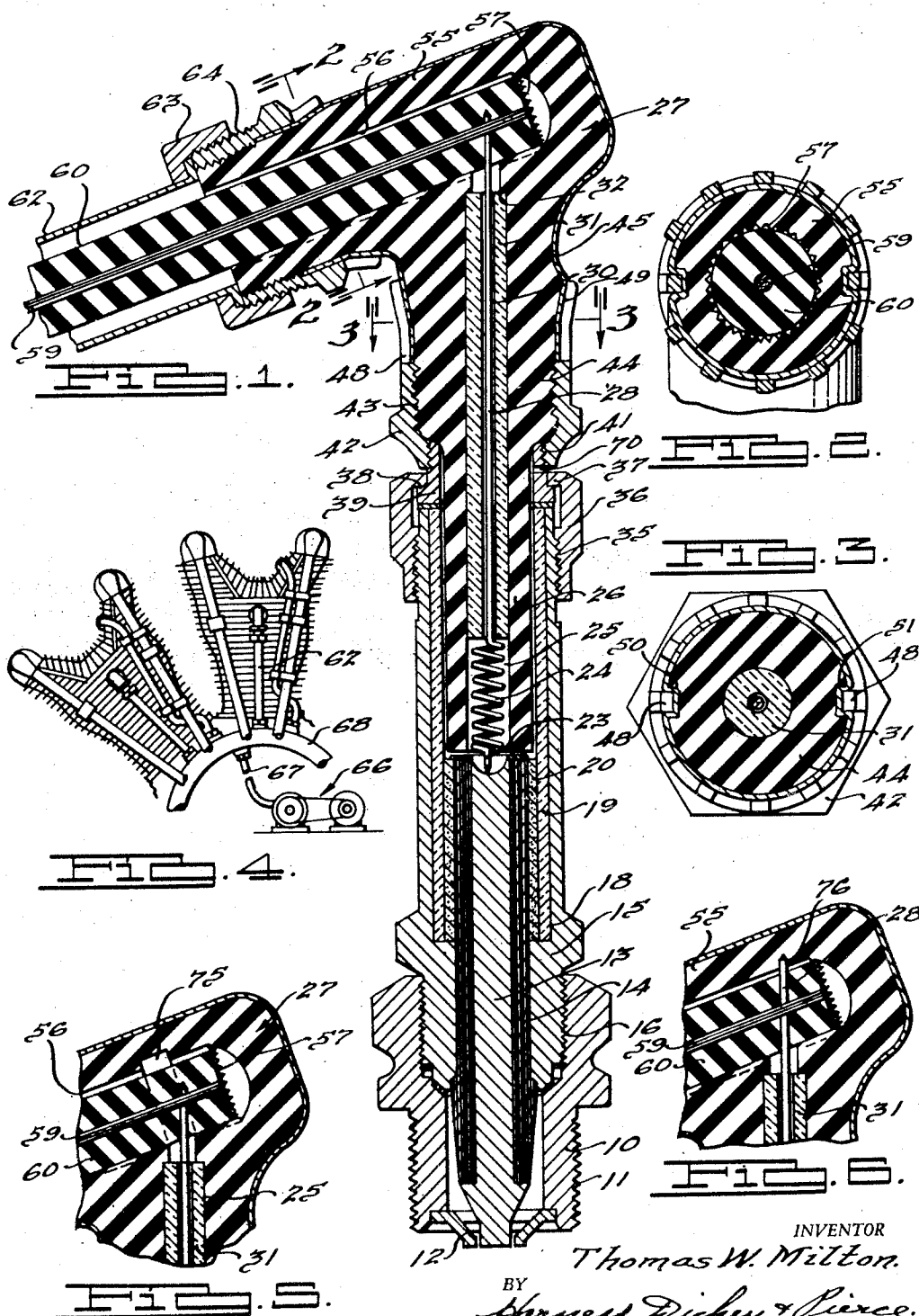
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T. W. MILTON

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SHIELDED SPARK PLUG CONNECTOR

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INVENTOR

Thomas W. Milton.

BY

Harner, Dickey & Pierce.
ATTORNEYS

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SHIELDED SPARK PLUG CONNECTOR

Thomas W. Milton, Detroit, Mich., assignor to
Flex-O-Tube Company, Detroit, Mich., a cor-
poration of Illinois

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The invention relates to shielded spark plug connectors and it has particular relation to connectors designed for use on airplane motors or the like.

In certain respects the invention is related to and constitutes an improvement on that embodied in my copending application for patent, Serial No. 437,746, filed April 6, 1942, now Patent No. 2,348,919, dated May 16, 1944, and relating also to Shielded spark plug connectors.

One object of the present invention is to provide an improved spark plug connector which is more efficient in use, to the end that a good spark will constantly be obtained in the operation of the airplane motor.

Another object of the invention is to provide an improved spark plug connector of such character that electrical conductors employed in the connector will be efficiently protected against the deteriorating effects of moisture or the like.

Another object of the invention is to provide improved ignition connections to a spark plug which are more durable and more resistant to corona discharges.

Another object of the invention is to provide improved ignition connections to a spark plug wherein air under pressure is provided around the electrical conductors while still obtaining circulation of the air or ventilation so as to avoid moisture condensation and resultant deterioration of connector parts.

Another object of the invention is to provide improved ignition connections to a spark plug wherein cooling of the plug is obtained to a greater extent.

Another object of the invention is to provide an improved connector for spark plugs wherein the several parts are easily assembled and are positively and efficiently held in assembled relation.

Other objects of the invention will become apparent from the following specification, from the drawings accompanying the specification, and from the claims hereinafter set forth.

For a better understanding of the invention, reference may be had to the accompanying drawing wherein:

Figure 1 is a vertical, cross-sectional view illustrating a spark plug and connector assembly constructed according to one form of the invention;

Figure 2 is a cross-sectional view taken substantially along the line 2—2 of Figure 1;

Figure 3 is a cross-sectional view taken substantially along the line 3—3 of Figure 1;

Figure 4 is a generally diagrammatic view

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illustrating a pumping system for supplying air under pressure to spaces around the electrical conductors;

Figure 5 is a detail view illustrating a modified form of air conducting passage in the elbow portion of the conductor; and

Figure 6 is a view similar to Figure 5 showing a conductor arrangement which more positively anchors the insulating sleeve and conductor at the ignition side of the connector.

Referring to Figure 1 in particular, the spark plug illustrated comprises a body 10 having an externally threaded portion 11 for securing the body in a spark plug opening and an electrical terminal 12 on the lower end of the threaded portion. The body 10 is tubular so as to accommodate a central terminal 13 enclosed by insulation 14 and this terminal extends to a point adjacent the first terminal 12. The terminal 13 and insulation 14 are fastened in a tubular element 15 threaded as indicated at 16 into the body 10. The opening in the upper part of the element 15 is enlarged as indicated at 18 and receives an insulating sleeves 19 such as one composed of porcelain and between the lower portion of this sleeve and the upper part of the insulation 14, cement 20 is employed so as to firmly hold the parts in position.

The upper end of the terminal 13 has electrical contact with an axially projecting end 23 of a spring 24. This spring is located in the lower end of a central opening 25 formed in a tubular leg 26 of a connecting elbow indicated generally at 27. Preferably the elbow is formed from a molded plastic of insulating character as will be readily understood by those skilled in the art. A straight wire 28 extends from the upper end of the spring 24 and this wire passes through a central bore 30 formed in an inner insulating tube 31 which may be formed from porcelain for instance. This tube at its upper end engages a shoulder 32 in the upper end of the opening 25 and, accordingly, the lower projection 23 on the spring is resiliently held in contact with the upper end of the terminal 13. It may be observed too, that the tube 31 and the spring mutually position each other since the spring holds the porcelain in its upper position and the compression of the spring holds the terminal points in contact.

For securing the leg or projection 26 on the elbow to the sleeve or tubular element 15 forming part of the spark plug, the upper end of such element 15 is externally threaded as indicated at 35 and receives a coupling 36 which is threaded thereon. This coupling has an in-

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wardly turned flange 37 at its upper end which engages an annular rim or collar 38 on a bushing 39 so that when the coupling is applied, the bushing is moved into a position against the end of the element 15 and against the insulating sleeve 19. At its opposite end, the bushing is threaded externally as indicated at 41 and this threaded portion is threaded into the lower internally threaded end of a fitting 42. In turn, the fitting 42 has threaded engagement, as indicated at 43, with the external surface of an enlarged portion 44 of the elbow projection or leg 26 and from this it follows that the elbow is positively connected to the spark plug. It will be noted that the parts are so applied that the upper end of the bushing 39 sealing contacts the lower end of the enlarged portion 44 of the elbow.

Excepting for the area of threaded engagement 43, the exposed elbow plastic is coated or electro-plated with a thin covering of copper shielding 45 employed to protect the plastic and also to shield the electrical conductors so as to minimize radio interference. In order to obtain good electrical contact with this coating, the upper end of the fitting 42 has a series of circumferentially spaced fingers 48 extending over the coating and these grip and closely contact the coating. As shown at 49, the plastic wall within the fingers 48 is slightly tapered so that the latter have to expand as the fitting is threaded into place, thereby obtaining good contact with the coating and also reinforcing the plastic. If desired, the fingers might be soldered to the coating in the manner stated in the previously identified application. In order to positively prevent turning of the coupling 42 on the extension 25 of the elbow, the molded plastic and coating thereon are formed with diametrically opposed grooves or slots 50 and 51 and two of the fingers 48 are bent into these slots so that the resulting engagement positively holds the fitting against turning. It will be observed that the fitting may be threaded on to the leg 26 to such an extent that two of the opposed teeth are aligned with the grooves and that then such teeth may be bent into interlocking positions. Soldering of the fitting to the coating would be effected after locating the fitting in this manner.

The elbow 27 includes a second leg or extension 55 which has a central opening 56 intersecting the opening 25 in the first extension or leg 26. The opening 56 has axially extending serrations 57, shown best by Figure 2, and within the serrated opening, a wire or electrical conductor 59 covered by insulation 60 is provided. It will be understood that the size of this insulated conductor is such as to obtain a rather binding fit with the surface 57, so that normally the conductor tends to remain in place. The wire 59 has electrical contact with the straight wire portion 28 extending upwardly in the first leg 26 of the elbow and this connection is made by extending the upper end of the wire 28 through the insulation 60 until it contacts the wire 59.

Beyond the end of the leg 55 of the elbow, a metal shield or tube 62 encloses the insulated wire 59 and this tube is connected by means of a coupling 63 to a threaded fitting 64 which is fastened to the leg 55 of the elbow in the same manner as described in connection with the fitting 42. Hence, the tube 62 is positively anchored to the elbow and the coating or shield on the elbow has good electrical contact with the tube.

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It has been found desirable to supply air under pressure around the conductors leading to the connector and around the conductors within the connector and this is accomplished by means of a pump indicated generally at 66 in Figure 4. An air pressure supply line 67 connected to the pump leads to a tubular ignition ring 68, which, in turn, has connection with the tube 62 enclosing the ignition conductor 59. This air under pressure flows between the tube 62 and the insulation 60, through the spaces between the serrations 57 in the leg 55 of the elbow, then through the upper end of the opening 25 in leg 26 of the elbow. The opening in the tubular element 31 is slightly larger than the wire 28 and hence the air under pressure flows from the upper end of the opening 25 downwardly around the wire and then into the lower end of the opening 25 around the spring 24. It then flows radially over the lower end of the leg 26 of the elbow and then upwardly through a small space provided between the outer surface of such leg and the insulating sleeve 19. This small space exists also between the bushing 39 and the leg 26 of the elbow so that the air flows upwardly into the bushing. At a point between the coupling 36 and the fitting 42, the bushing has a small opening 70 by means of which the air may escape or exhaust slowly. From this description it will be apparent that air under pressure is delivered to the spaces indicated and that pressure can be maintained around the conductors and insulating parts while still allowing air to slowly escape. This is of considerable importance in that the circulating air acts to cool the conductors and plug and furthermore collection or condensation of moisture is largely prevented. At the same time, the air under pressure serves advantageously to resist corona discharges such as occur in ignition systems and connectors of this type.

Referring now to Figure 5, the elbow is generally the same as already described, but in addition, an annular groove 75 is provided around the inner periphery of the opening 56 and this groove is aligned with the upper end of the opening 25. As a result, air flowing along the serrations 57 may flow directly to the opening 25 by way of the groove 75. The flow of air along the serrations is therefore more uniformly distributed.

In the structure shown by Figure 6, the wire 28 extends entirely through the insulation 60 and projects a short distance into the wall of the elbow projection 55 as indicated at 76. This arrangement provides a stronger anchor for the insulated conductor 59 so that withdrawal of the conductor from the elbow is even more positively prevented.

The structures illustrated are very durable and once assembled, the parts will remain assembled against accidental loosening. The fittings on the two legs of the elbow are positively held against turning and this is of importance since in the assembling of the couplings and other parts, there is no danger of loosening of the fitting and hence interruption of the shield contacts with the elbow covering. By maintaining air pressure around the insulations and around the conductors, corona discharges are minimized. Furthermore, by having this air under pressure open to a small exhaust opening, circulation of the air is allowed gradually to occur and this promotes cooling and avoids collection of moisture and undesirable deterioration resulting from the presence of moisture. Hence, the structure

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ensures delivery of a good spark constantly to the cylinder of the engine, avoids corona discharges in a highly efficient manner, and shields the electrical conductors so as to avoid radio interference.

Although more than one form of the invention has been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the spirit of the invention.

What is claimed is:

1. A connector for spark plugs comprising a conductor adapted to be connected to an ignition system, a second conductor extending crosswise of the first and connected thereto, an elbow of insulating material encasing the conductors adjacent their connection, a thin coating of shielding material covering the outer surface of the insulating material, a tubular coupling having an end portion threaded onto an end portion of the elbow, and means for preventing relative turning of the coupling and elbow while allowing for adjustable application of the coupling and comprising a depression in the surface of said end portion of the elbow, and a series of circumferentially separated fingers on said end portion of the coupling and extending axially over said end of the elbow with one of the fingers bent into the depression.

2. A connector for spark plugs comprising a tubular insulated element, a thin coating of elec-

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trical shielding metal covering the outer surface of the insulating material, a coupling having an end portion threaded onto one end of the insulated element, and means for preventing relative turning of the coupling and element while allowing for adjustable application of the coupling and comprising a depression in the surface of said element and a series of circumferentially separated fingers on said coupling and extending over said element with one of the fingers bent into the depression.

THOMAS W. MILTON.

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