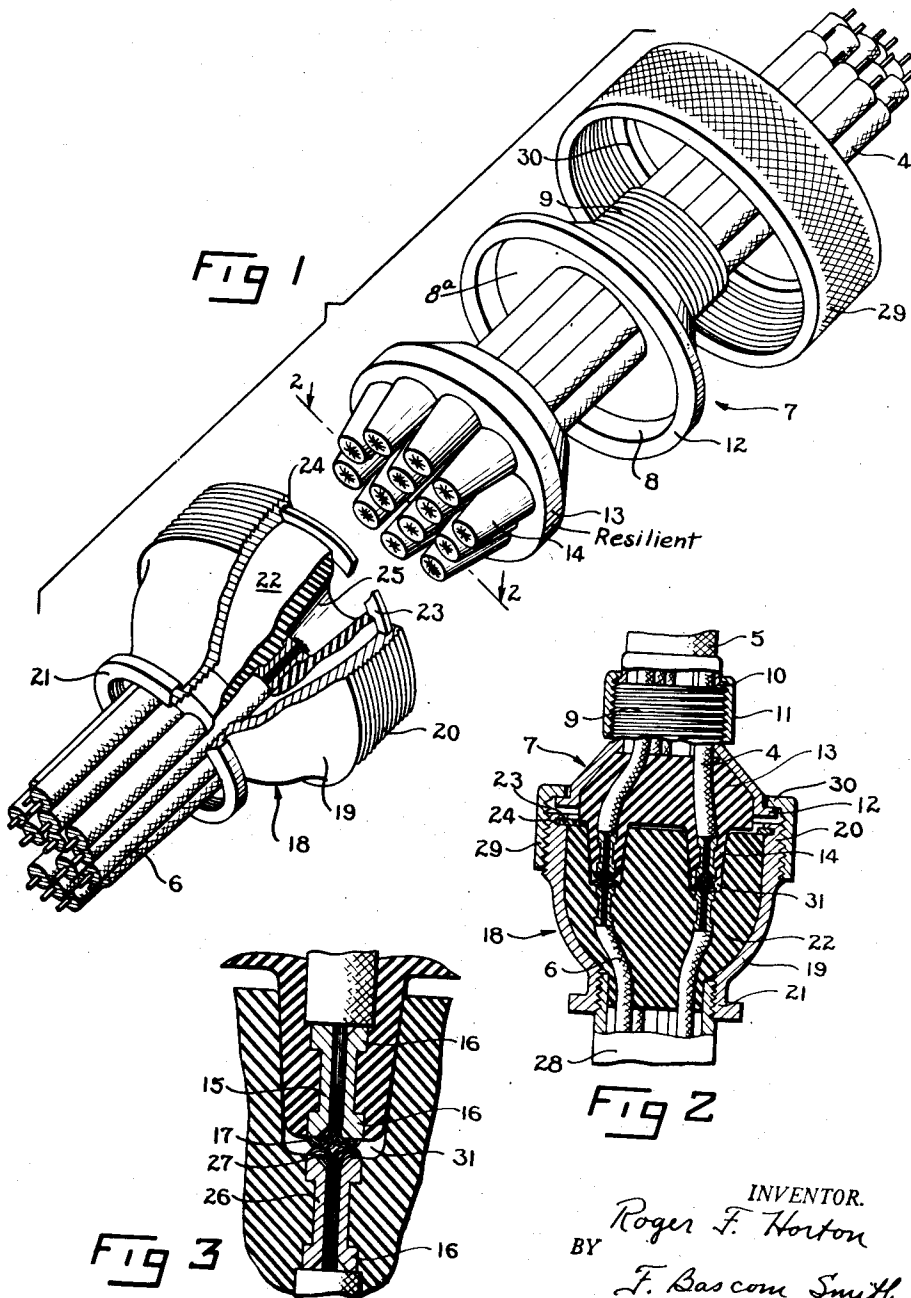


March 10, 1942.

R. F. HORTON
ELECTRICAL CONNECTING MEANS

2,275,762

Filed April 20, 1939



INVENTOR.
Roger F. Horton
BY *F. Bascom Smith*
ATTORNEY

UNITED STATES PATENT OFFICE

2,275,762

ELECTRICAL CONNECTING MEANS

Roger F. Horton, Hempstead, N. Y., assignor to
Bendix Aviation Corporation, South Bend, Ind.,
a corporation of Delaware

Application April 20, 1939, Serial No. 268,884

5 Claims. (Cl. 173—328)

This invention relates to electrical apparatus and more particularly to connecting and protecting means adapted for connecting a plurality of conductors in one or more circuits.

One of the objects of the present invention is to provide novel means for connecting electrical conductors.

Another object of the invention is to provide a novel device for electrically connecting conductors whereby the electrical contact between said conductors takes place in a moisture-proof chamber and whereby a large number of connections may be made in a small space with minimum losses resulting from corona-effect and creepage.

Another object is to provide a novel radio shielded plug and receptacle wherein one set of electrical conductors is connected to another set of conductors, the contact points at the connections between each pair of conductors being insulated from one another in a novel manner.

A further object of the invention is to provide a novel plug and receptacle of the above type wherein the sets of conductors carried by the respective members are compactly arranged producing a connecting unit occupying a minimum space.

Still another object of the invention is to provide novel means whereby two conductors may be electrically connected, the contacting portions of said conductors being pressed into engagement with each other to produce a connection having a high conductive efficiency.

A still further object is to provide a novel plug and receptacle which, when operatively assembled, produces a permanent connection between two groups of conductors but which may be readily disconnected when desired.

The above and other objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawing. It is to be expressly understood, however, that the drawing is for the purpose of illustration only and is not intended as a definition of the limits of the invention, reference being primarily had for this latter purpose to the appended claims.

In the drawing, wherein like reference characters refer to like parts throughout the several views:

Fig. 1 is an exploded perspective view showing one form of device embodying the present invention;

Fig. 2 is a sectional view, with parts broken

away, showing the parts of Fig. 1 in assembled relation, the section being taken substantially along line 2—2 of Fig. 1 and along the axis of the device; and

Fig. 3 is an enlarged sectional view showing in detail a portion of the structure illustrated in Fig. 2.

A single embodiment of the present invention is illustrated in the drawing, by way of example, in a suitable form for use in the circuit of a high tension ignition system to effect a connection between corresponding conductors of two sets of cables of said system. A plurality of insulated conductors 4, leading, for example, from a shielding harness (not shown) for the ignition system of an internal combustion engine and shielded in a flexible metallic conduit 5, may be electrically connected by means of the novel connector of the present invention to a like number of insulated conductors 6 leading, for example, to a distributor or magneto (not shown) to thus complete circuits between the spark plugs of said ignition system and the magnets or other source of electrical energy.

Novel means in the form of a plug 7 are provided for supporting the ends of conductors 4 in predetermined spatial relation to each other and for exposing said ends for electrical contact. As shown, plug 7 comprises a metal casing or cover 8 serving as a radio shield and having an externally threaded collar 9 formed therewith through which conductors 4 pass. Conduit 5 has a flanged ferrule 10 fixed to the end thereof and is preferably connected to collar 9 by a nut 11 which engages the flange of said ferrule and threadedly engages collar 9 in a manner well known in the art. The main or body portion 8a of cover 8 is larger than collar 9 and may be conically shaped with an external flange 12 formed at the open end thereof.

A block or matrix 13 of suitable insulating material which is preferably resilient, such as a rubber compound, is provided for securely imbedding the ends of conductors 4 after the latter have been directed through collar 9. Block 13 conforms to the shape of casing 8 and has a close sliding fit therein. A plurality of conically shaped projecting members 14, preferably equal in number to the number of conductors 4, are formed integrally with block 13, said members extending downwardly from said block, as viewed in Fig. 2, and beyond the open end of casing 8. Conductors 4 are directed through the body of said block, each conductor extending into one of said projecting members 14 (Fig. 2).

In order to locate conductors 4 centrally within projecting members 14 and to securely fix said conductors within said members, a metallic sleeve 15 may be imbedded in each of said members with the axis of the opening therethrough substantially coincident with the axis of said member. To securely position sleeve 15 in member 14 the former are preferably shaped somewhat like a spool, having shoulders 16 formed at the ends thereof and having the portion intermediate said shoulders in close engagement with the material of said projecting member. As shown, the outer ends of sleeves 15 are flush with the outer ends of members 14 and uninsulated portions of conductors 4 extend therethrough. The outer or exposed ends of said conductors are flared as at 17 for contact with conductors 6 and may be soldered or otherwise secured to prevent the withdrawal thereof from sleeve 15 and block 13.

A novel receptacle or socket 18, which is adapted to cooperate with the above described plug 1 in a novel manner, comprises a metallic casing 19 having external threads 20 at one end thereof and an internally threaded collar 21 of reduced diameter at the other end. A block 22 of suitable insulating material, such as "Bakelite," having a shape conforming to the dome shaped interior of casing 19 is supported by the latter and is preferably fixed in said casing by a lock washer 23, said washer being inserted in a peripheral groove 24 in the wall of said casing. For the purpose of receiving projecting members 14, a plurality of conically shaped or tapered recesses 25 are provided in the face of block 22, said recesses comprising cone frustrums having slightly smaller base diameters than the frustrums constituted by said projecting members. The walls of said recesses are also preferably inclined at a lesser angle than the walls of said members. Sleeves 26, similar in shape to sleeves 15, are preferably imbedded in block 22, one end of each of said sleeves forming a portion of the bottom wall of one of said recesses.

Conductors 6 are directed through collar 21 of casing 19 and are imbedded in block 22, the same being preferably molded therein. The ends of said conductors extend through sleeves 26 and are flared and soldered into contacting masses 27 which project beyond and cover a portion of the bottom surface of the recesses 25. A shielding conduit may be provided for conductors 6, a rigid conduit 28 being shown, said conduit is secured to casing 19 by threadedly engaging the interior of collar portion 21.

In order to operatively assemble plug 1 with receptacle 18 a knurled internally threaded sleeve or nut 29 having an inwardly extending flange 30 formed therewith is provided, said nut being adapted to operatively engage screw threads 20 on casing 18 with flange 30 thereof engaging flange 12 of casing 8. When nut 29 is screwed tightly, casing 8 applies a compressive force to block 13 urging the same in the direction of block 22, and projecting members 14 are thus forced into recesses 25 and compressed or deformed to fit tightly into the latter. The pressure engagement between the walls of said recesses and said members, which is thereby produced, maintains spaces 31 between the ends of said members and the bottoms of said recesses substantially moisture-proof and air-tight. These hermetically sealed spaces are the chambers within which electrical connections between conductors 4 and 6 are made. The force applied by nut 29, in addition to sealing said chambers,

compresses masses 17 and 27 into tight engagement with each other and thus effectuates a very efficient electrical connection the efficiency of transmission of which may be increased by increased compression, which in turn, is produced by tightening nut 29.

The novel connecting unit comprising plug 1, receptacle 18 and nut 29 may be readily disconnected after assembly by unscrewing said nut and yet, during operation, the unit provides permanent and positive connections between high tension conductors which connections are not subject to "corona effects" because of the high degree of insulation provided for each of chambers 31 in which electrical contact takes place. An exceptionally effective means for preventing the leakage of moisture into the contact chambers is provided by the yielding engagement between resilient projecting members 14 and the rigid walls of recesses 25. A further insurance against leakage and the undesirable effects thereof results from the provision of shielding casing 8, 19.

There is thus provided a novel connector unit whereby a plurality of high tension conductors may be effectively connected to other conductors within a compact radio shielded device occupying comparatively little more space than the insulated conductors which are being connected. Furthermore, the chambers within which electrical contacts are made are impervious to moisture and each is very effectively insulated from all the others. In addition, a single means effects the hermetic seal of the contact spaces and produces a pressure contact between the conductors which insures that a connection of high conductivity will result.

Although only a single embodiment of the invention has been illustrated and described, it is to be expressly understood that the same is not limited thereto. For example, it will now be apparent to one skilled in the art that the block having the projecting members may be formed from a rigid material while the block having the recesses may be formed from a resilient material or that both may be of the same material. Various other changes may be made in the design and arrangement of parts illustrated without departing from the spirit and scope of the invention. For a definition of the limits of the invention reference will be had primarily to the appended claims.

What is claimed is:

1. A radio shielded plug and receptacle for making a plurality of electrical connections comprising a block of insulating material having a plurality of resilient cone-like, non-concentric projecting portions thereon, a plurality of conductors extending through said block, each of said conductors having a terminal in the wall of one of said portions, an insulating matrix having tapered recesses provided therein for receiving said members, a plurality of conductors carried by said matrix, each of said conductors having a terminal in the wall of one of said recesses, and means engaging said block and said matrix to hold each of said portions in tight engagement with the walls of one of said recesses and to electrically connect the terminals of said conductors.

2. A radio shielded connector comprising a block of insulating material having a plurality of cone-like, non-concentric projecting members formed thereon, a plurality of conductors imbedded in and extending through said block,

each of said conductors having a terminal in the wall of one of said members, a block of insulating material having recesses formed therein for receiving said members, one of said blocks being formed of resilient material and the other of rigid material, a plurality of conductors imbedded in and extending through said last-named block, each of said conductors having a terminal in the wall of one of said recesses, and means engaging said blocks for forcing said members into said recesses to effect an electrical connection between said conductors.

3. In apparatus for making a plurality of electrical connections, a block of insulating material having a plurality of conically-shaped projecting members formed therewith, metallic sleeves imbedded in said members, each of said sleeves forming a portion of the end surface of one of said members, a set of conductors extending through said block, each of said conductors extending through one of said sleeves and having the end portion thereof exposed at the end of said sleeve, a block of insulating material having conically-shaped recesses formed therein, said recesses having a lesser maximum diameter than said members, at least one of said blocks being formed of resilient material, metallic sleeves imbedded in said last-named block, each of said last-named sleeves forming a portion of the bottom surface of one of said recesses, a set of conductors extending through said last-named block, each of said last-named conductors extending through one of said last-named sleeves and having the end portion thereof exposed at the end of said sleeve, and means encasing said blocks and applying a pressure thereto to force said members into tight engagement with the walls of said recesses and to press the extending end portions of the conductors of said sets into electrical contact.

4. A radio shielded plug and receptacle for making a plurality of electrical connections comprising a plug consisting of a matrix having a plurality of frustro-conical projections extending from one side thereof, a metallic sleeve imbedded in the outer end of each of said projections and a group of conductors imbedded in said matrix, each of said conductors having an end portion extending through and secured to one

of said sleeves, a receptacle consisting of a matrix of insulating material having a plurality of recesses in one side thereof for receiving said projections, the diameter of each of said recesses at the surface of said receptacle being less than the maximum diameter of the corresponding one of said projections, a group of metallic sleeves imbedded in the receptacle matrix, one end of each of said last named sleeves forming at least a portion of the end wall of one of said recesses, a group of conductors imbedded in said receptacle matrix, each of said last-named conductors having an end portion extending through and secured to one of said last-named sleeves, a tubular metallic casing surrounding each matrix, and a nut having an internal flange engaging one of said casings and threads engaging the other of said casings whereby said casings are mechanically connected and the conductors of said first-named group are held in electrical contact with the conductors of said second-named group.

5. In apparatus of the class described, a plug comprising a matrix of resilient insulating material having a plurality of conically-shaped projecting members formed therewith, a metallic sleeve imbedded in the outer end of each of said members, a group of conductors imbedded in said block and extending through and secured to said sleeves, one of said conductors terminating at the end of each of said members and a casing surrounding said block, a receptacle comprising a block of insulating material having a plurality of recesses formed therein for receiving said projecting members, a metallic sleeve imbedded in said last-named block adjacent each of said recesses, a conductor extending through each of said last-named sleeves and terminating at the bottom of one of said recesses, and an externally threaded casing surrounding said last-named block, and a nut member having a flange formed therewith, said nut member being adapted to threadedly engage one of said casings and having an internal flange engaging an external flange on the other of said casings for forcing said members into said recesses to hold the conductors of one of said groups in contact with the conductors of the other of said groups.

ROGER F. HORTON.