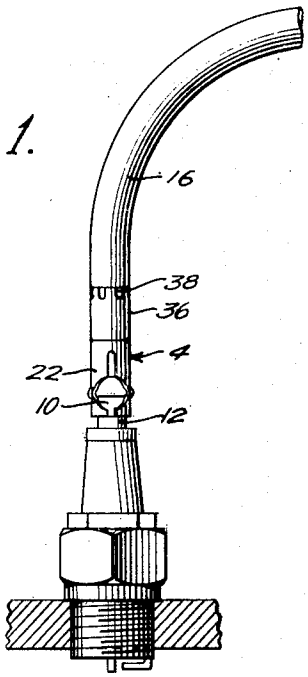
Dec. 17, 1935. R. A. BELL 2,024,814

ELECTRICAL CONNECTER

Filed Nov. 18, 1932

Fig. 1.



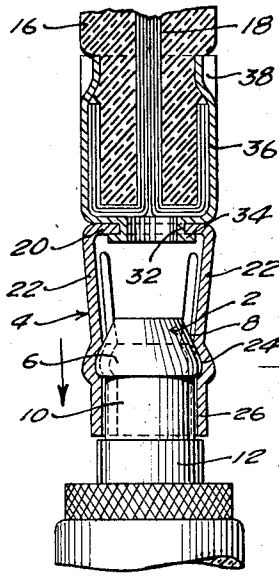


Fig. 2.

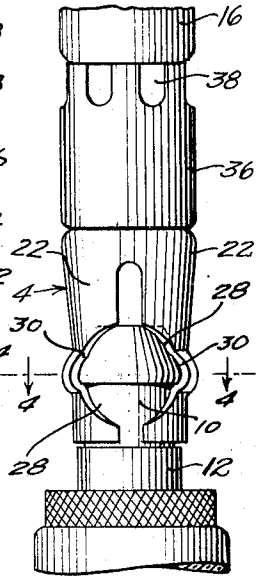


Fig. 3.

Fig. 4.

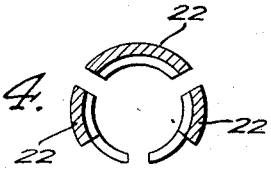


Fig. 5.

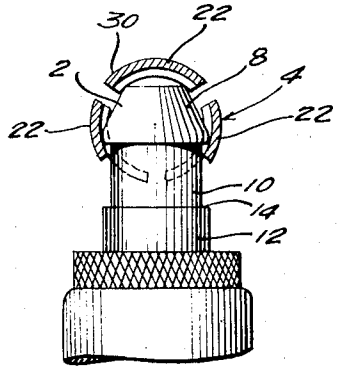
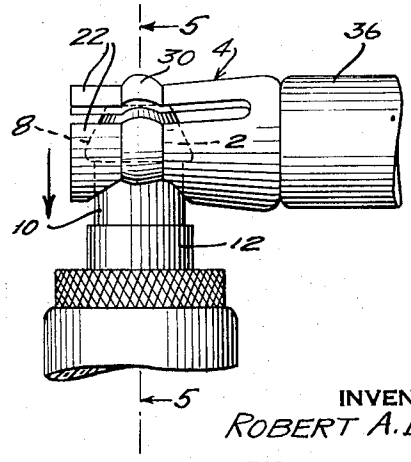


Fig. 6.



INVENTOR
ROBERT A. BELL

BY
Merrell & Spencer
ATTORNEYS

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ELECTRICAL CONNECTER

Robert A. Bell, Montclair, N. J., assignor to The Rajah Company, Bloomfield, N. J., a corporation of New Jersey

Application November 18, 1932, Serial No. 643,213

2 Claims. (Cl. 173—269)

This invention relates to electrical connecters and more particularly to electrical connecters for detachably connecting electrical conductors to spark plugs of internal combustion engines. The invention is not limited in its application however to connecters for connecting conductors to spark plugs but it may be embodied in connecters adapted for other uses.

In certain internal combustion engines the location of the spark plugs in the engine casing is such as to require that the electrical conductors connected with the spark plugs each shall be connected with the corresponding plug with its axis in substantial alignment with, or extending in the same direction as, the axis of the plug, and shall be held in this position. In other engines the installation requires that the electrical connecters shall each be connected with the corresponding plug with the axis of the connecter extending in a direction transverse to the axis of the plug, and in certain cases, substantially perpendicular to the axis of the plug. The electrical connecters of an internal combustion engine deteriorate with age and often require renewal. To maintain in stock different sets of conductors respectively having connecters for attachment to the spark plugs in the two positions referred to above greatly increases the investment in stock required by the jobber and the retailer and it is obviously desirable that the connecters on such conductors should be adapted for either installation.

The principal object of the present invention is to improve the construction of electrical connecters and to produce a connecter which is simple in construction and inexpensive to manufacture and in which the members of the connecter may be connected with each other, either with their axes extending in the same general direction, or in directions transverse to each other.

With the above and other objects in view, the invention comprises the novel and improved features, constructions and combinations of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawing illustrating the invention in its preferred form and the following detailed description of the constructions therein shown.

In the drawing—

Fig. 1 is a view in side elevation illustrating a connecter embodying the invention applied in one position to a spark plug;

Fig. 2 is a view, partly in side elevation and partly in axial section, of the connecter construction illustrating the parts connected together in the relative positions shown in Fig. 1;

Fig. 3 is a view in front elevation illustrating the connecter with the parts in the relative positions shown in Figs. 1 and 2;

Fig. 4 is a sectional view illustrating the construction of one of the members of the connecter taken substantially on the line 4—4 of Fig. 3;

Fig. 5 is a view partly in side elevation and partly in section taken substantially on the line 5—5 of Fig. 6, illustrating the connecter with the members thereof connected together with their axes in relatively transverse positions; and

Fig. 6 is a view in front elevation of the connecter construction with the members thereof in the relative positions shown in Fig. 5.

In the construction shown in the drawing, the electrical connecter comprises a male connecter member 2 and a female connecter member 4.

The male connecter member 2 consists of a stud constructed to be attached to the inner terminal of a spark plug preferably by threading the stud on said terminal. This stud is provided with an enlargement 6 having an abrupt inner shoulder to be engaged by the female connecter member and with an inclined or beveled surface 8 leading to said enlargement. The stud is also provided with a portion 10 inside of said shoulder, preferably cylindrical in form and with a second substantially cylindrical portion 12 inside of said portion 10 and somewhat larger in diameter and forming a shoulder having an outer contact face 14.

The female member 4 of the connecter is preferably constructed from sheet metal, is secured to one end of an electrical conductor 16 and is connected electrically with the conductor wires 18 of said conductor. The member 4 is provided with a base 20 from which extend in a direction substantially perpendicular to said base a series of flexible resilient arms 22, each preferably arcuate in cross section. These arms are preferably equally spaced from a line passing centrally through the base 20 substantially perpendicular thereto which will be hereinafter referred to as the axis of the connecter or terminal member.

Each of the arms 22 is provided at a point at some distance from the end of the arm with a

recess 24 preferably shaped to conform generally to the surface of the enlargement 6 and arranged to receive said enlargement. Each arm is also provided with a portion 26 located outside the recess for engagement with the cylindrical portion 10 of the stud 2 to hold the terminal member 4 substantially in axial alignment with the stud. In the construction shown, each of the portions 26 is shaped in cross section to conform to the surface of the cylinder. The ends of the arms 22 are arranged to engage the outer contact face 14 of the shoulder on the portion 12 of the stud to limit the movement of the member 4 axially of the stud 2, in one direction.

Figs. 1, 2 and 3 show the member 4 connected to the stud member 2 with the axes of said members in substantial alignment. The member 4 is applied to the stud with the outer end of the stud engaging between the outer ends of the arms 22 and with the axis of the member 4 substantially aligned with the axis of the stud, and the member 4 is then forced in the direction of the arrow, Fig. 2. During the initial part of this movement the ends of the arms, which are engaged with the beveled surface 8 of the stud, are forced apart and the spreading of the arms allows the stud to be forced between the arms until the enlargement 6 is in position to engage in the recesses 24. The resilience of the arms then carries the arms inwardly to engage the enlargement in said recesses and to carry the portions 26 of the arms into position to engage the portion 10 of the stud. The movement of the member 4 in the direction of the arrow, of course, will be limited by the contact of the ends of the arms 22 with the contact face 14 on the portion 12 of the stud. With the parts in the positions shown in these figures, the member 4 will be held from substantial angular movement with relation to the stud 2, in directions transverse to the axes of the stud and the member 4, by the contact of the portions 26 of the arms 22 with the portion 10 of the stud.

In order to enable the member 4 to be applied to the stud 2 with the axis of said member sharply transverse to the axis of the stud, as shown in Figs. 5 and 6, two of the arms 22 are cut away to form recesses 28 facing toward each other, as shown in Figs. 3 and 4. These oppositely-facing recesses together form an opening between the arms 22 in which they are cut, slightly smaller than the diameter of the enlargement 6, and are provided with beveled faces 30 for engagement with the beveled face 8 of the stud.

With this construction, to connect the member 4 to the stud 2 with the axis of said member sharply transverse to the axis of the stud, as shown in Figs. 5 and 6, the said member is positioned to insert the outer end of the stud within the opening formed by the recesses 28, the said member being held with its axis substantially perpendicular to the axis of the stud. The member 4 is then forced in the direction of the arrow, Fig. 6. The engagement of the beveled surfaces 30 on the arms 22 at the borders of the recesses 28 with the beveled surface 8 on the stud forces apart said arms until the enlargement 6 passes the portions of said arms at the borders of the recesses and the resilience of the arms swings them back toward each other inside the enlargement. The stud finally reaches the position with relation to the member 4 shown in Figs. 5 and 6. When in this position the arms 22 at the sides of the stud engage the enlargement on the stud and the other arm 22 engages the end of the stud, thereby securely holding the stud and the member 4 in the relative position shown. The member 4 however may be readily withdrawn from the stud by moving the ferrule 36 or the wire connected thereto in a direction opposite to the direction of the arrow, Fig. 6. Such a pull, as will be evident, tends to swing the terminal in an arc about its outer end and to pry it off of the male terminal, with the ends of the fingers beyond the recess serving as a fulcrum the arms 22 at the sides of the stud being forced apart during this movement of said member by their engagement with the rounded side surfaces of the enlargement 6, allowing the enlargement to pass between the same.

Fig. 2 of the drawing shows clearly one manner of attaching the connecter member 4 to the conductor 16. As shown in this figure, the base 20 is provided with a central opening 32 in which is inserted an extension 34 of relatively small diameter formed on a ferrule 36. This extension is provided with an outturned flange to secure the member 4 to the ferrule. The ferrule 36 is secured over the end of the conductor 16 preferably by crimping the same on the conductor, as indicated at 38. The conductor wires 18 which extend for some distance beyond the end of the insulation on the conductor 16, are divided and each divided portion is turned outwardly over the end of the insulation and then backwardly over the outer surface of the insulation. The ferrule 36 is applied over the outwardly and backwardly turned conductor wires so that the ferrule engages and makes a good electrical contact with said wires.

The present connecter is comparatively simple in construction and inexpensive to manufacture, and the parts of the same will be securely held in either of the two relative positions required. The connecter member 4 may be formed from sheet metal by ordinary cutting and stamping operations, and may therefore be manufactured at relatively low cost. The provision of the present construction will make it unnecessary for the jobber or retailer to carry different sets of conductor wires with attached connecters for different installations, but one set of conductors with attached connecters may be used either in installations in which the female members of the connecters are required to be attached in axial alignment with the respective studs, and also in installations in which the female members are required to be attached with their axes respectively in sharply transverse positions with respect to the axes of the studs.

It is to be understood that the invention is not limited to the particular construction and arrangement of parts of the illustrated embodiment of the invention, but that the invention may be embodied in other forms within the scope of the claims.

Having explained the nature and object of the invention, and having specifically described a construction embodying the invention in its preferred form, what is claimed is:

I claim:

1. An electrical connecter comprising male and female terminals adapted to be separably assembled in longitudinal as well as transverse relation, the male terminal having an enlargement near its end and a narrower neck behind said enlargement, and the female terminal having more than two resilient fingers arranged about a geometrical figure approximately corresponding in shape and dimensions to those of the male

terminal, at least one of said fingers having a portion adapted, when the two terminals are assembled longitudinally, to extend inwardly toward the neck of the male terminal from an adjacent portion of said finger which extends over the enlargement of the male terminal, and at least two adjacent fingers each being cut back at the side facing the other to form a recess between them spaced from their ends and adapted to receive the neck of the male terminal, when the two terminals are assembled transversely, and each of said fingers having a portion nearer to its ends which extends partially across said recess to resist withdrawal of the neck of the male terminal therefrom, and a third finger thereof being approximately diametrically opposite to said recess and normally spaced therefrom a distance less than the distance from the narrowest part of the neck to the end of the male terminal whereby it will press against the end of the male terminal and serve to hold the two terminals in the transverse position.

2. An electrical connecter as defined in claim 1 in which the male terminal is substantially cylindrical except for the neck and a tapered portion near its end adapted by cam action to spread the fingers of the female terminal when pushed thereagainst and the fingers of the female terminal are adapted to embrace said cylindrical part whereby to hold the terminals in longitudinal relation.

ROBERT A. BELL.