Nov. 18, 1924. 1,515,860

A. HOWARD

ELECTRICAL CONNECTER

Filed March 26. 1923

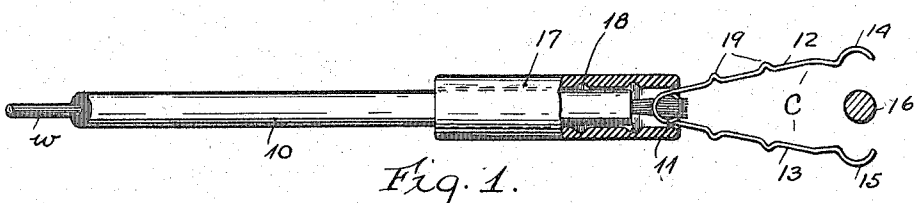

Fig. 1.

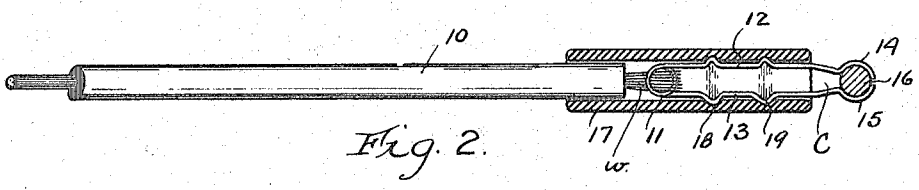

Fig. 2.

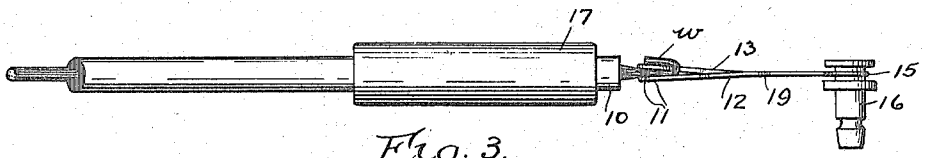

Fig. 3.

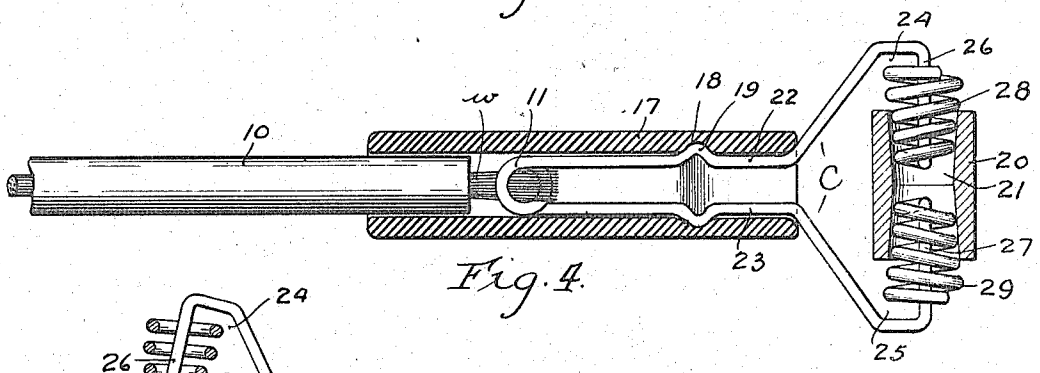

Fig. 4.

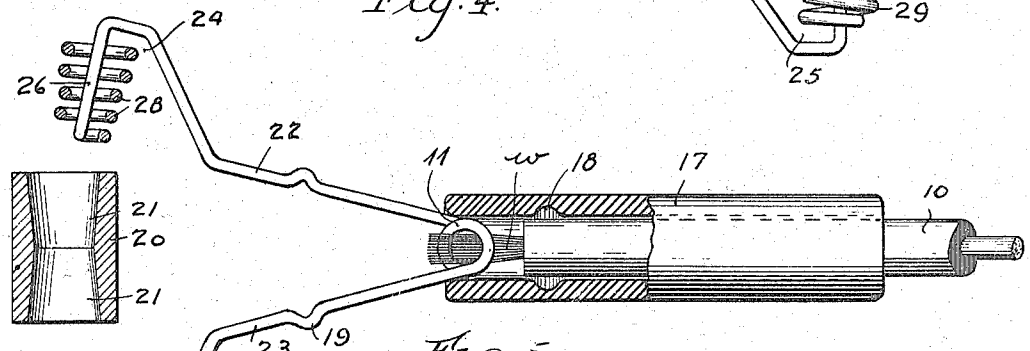

Fig. 5.

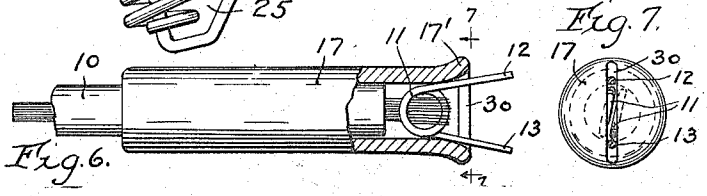

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

ALONZO HOWARD, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO CHARLES J. SCHMIDT, OF EVANSTON, ILLINOIS.

ELECTRICAL CONNECTER.

Application filed March 26, 1923. Serial No. 627,535.

To all whom it may concern:

Be it known that I, ALONZO HOWARD, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electrical Connecters, of which the following is a specification.

My invention relates to electrical connecters for connecting electrical conductors together or for connecting electrical conductors with electric circuit terminals, particularly when the electrical circuits are alive and it is desired to make connection without coming in contact with the conductor wire or the terminal, for example in gas engines where, for the purpose of testing out the spark plugs, connection or disconnection between the leads and the plug terminals are desired to be made while the engine is operating.

The important object of my invention is to provide a construction and arrangement with which clamping jaws may be positively forced into secure gripping and contact making engagement with the wire or terminal with which connection is desired, and to this end a sleeve of insulating material is slidable on the insulated conductor with which the clamping jaws are connected, the sliding of the sleeve over and along the clamping jaws effecting the positive gripping engagement with the terminal or wire. The ends of the jaws can be made of various shapes and forms depending upon the nature of the terminals with which connection is to be made.

On the accompanying drawing I show my improved connecter and various adaptations thereof. On the drawing,

Fig. 1 is a side elevational view of a conductor with a connecter thereon, the connecter being partly in section and in open position,

Fig. 2 is a side elevational view partly in sections showing the connecter closed in engagement with a terminal,

Fig. 3 is another side elevational view showing the clamping sleeve withdrawn, and showing more clearly the connection of the conductor wire with the clamping jaws,

Fig. 4 is a plan view partly in section of the connecter with spring ends for receiving terminals, such as battery terminals,

Fig. 5 is a similar view showing the clamping jaws open,

Fig. 6 is a plan view partly in section showing a modified arrangement, and

Fig. 7 is a view from plane 7—7, Fig. 6.

In the arrangement of Figs. 1, 2 and 3, 10 represents an insulated electrical conductor of the type usually used for the leads of an ignition system which connect with the spark plugs of the gas engine. The clamping element *c* of the connecter is formed from a single piece of spring wire bent intermediate its ends to form a plurality of turns or loops 11, and the clamping limbs or jaws 12 and 13 which at their end are shaped depending upon the nature of the terminal with which connection is to be made. As shown the ends of the limbs 14 and 15 are semi-circular for receiving the cylindrical terminal 16.

The end of the conductor 10 has its insulation cut away at the connecting end and the protruding wires *w* are then forced in between the adjacent turns or loops 11 whose spring resistance will securely clamp the wires and soldering will be unnecessary. The sleeve 17 of insulating material such as fibre, bakelite, redmonal, or other suitable material, is then slipped over the conductor 10. The clamping member *c* is primarily formed so that its spring action will hold the limbs 12 and 13 spread apart as shown in Fig. 1. Then when the sleeve 17 is slipped along over the limbs they will be positively forced together to bring their ends 14 and 15 into secure clamping engagement with the terminal 16, as shown in Fig. 2. In order to lock the sleeve in clamping position it may be provided with annular grooves 18, and the limbs 12 and 13 are provided with ridges or beads 19 spaced to correspond with the spacing of the sleeve grooves, so that when the sleeve is shifted outwardly the grooves will receive the ridges and the sleeve will thus be firmly locked in clamping position to hold the clamp ends firmly and securely and with good electrical engagement to the terminal. When connection is to be made the conductor 10 is held by one hand and the insulated sleeve manipulated with the other to close the clamp element on the terminal, and when it is desired to disconnect a pull is applied

to the sleeve to withdraw it to permit the clamping element to spread its limbs to release the terminal. During the connecting or disconnecting operation the person is fully protected against shocks as only insulation is touched during the operation. The connecter can thus be conveniently, safely and efficiently manipulated for connection or disconnection while the engine ignition circuit or other circuit is alive. The connecter does not depend upon any spring action to hold itself in engagement with the terminal, but the sleeve positively clamps and holds the connecter ends to the termial and disconnection is impossible until the sleeve has been sufficiently withdrawn to permit sufficient opening of the clamping element to release the terminal.

In Figs. 4 and 5 I show a construction of connecter which is particularly adaptable for connecting battery leads with the battery terminal. Here the cooperation of the sleeve with the clamp element limbs is the same as in the arrangement of Figs. 1, 2 and 3, but the ends of the limbs are formed to adapt them for secure engagement and contact with the ordinary type of battery terminals. In storage batteries, particularly when used on automobiles, it is difficult to keep terminals and connections clean and bright as acid will slop over and attack them. Usually the terminal is in the form of a cylindrical sleeve which is tapered, the lead wire being inserted therein and spreader screws applied to force the wires into contact with the terminal material. After these terminals are attacked by acid they are very hard to disconnect. By means of my improved connecter, these difficulties are all eliminated and connection and disconnection can be quickly made and firm and clean electrical contact will always be maintained between the terminals and the leads. I have shown the battery terminal 20 in the form of a cylindrical sleeve whose passageway 21 tapers inwardly from the ends. Near their outer ends the limbs 22 and 23 of the clamping element *c* is given U or V bends 24 and 25 whose sections 26 and 27 extend parallelly toward each other when the sleeve 17 is slipped over the clamp limbs. These sections 26 and 27 support coil springs 28 and 29 respectively and these springs may be integral parts of the clamping element and bent from the same piece of wire. The springs are conical with their apexes at the ends of the sections 26 and 27, the spring coils encircling the sections and being free therefrom except at the inner ends thereof where the sections are secured to the apexes. With this arrangement the connecter is brought up into the terminal as shown in Fig. 5, with the apex ends of the springs opposite the ends of the terminal passageway 21. The sleeve 17 is then slid outwardly over and along the limbs 22 and 23 which causes the limbs to be brought together to carry the coil springs into the terminal passageway, the conical angle of the springs being slightly greater than the conical angle of the tapered passageway 21 so that as the springs enter the passageway when the limbs 22 and 23 are forcibly brought together the coils will be contracted, and their expansion effort will be exerted against the terminal walls to insure clean, rigid electrical connection therewith. As the limb sections 26 and 27 are connected with the apexes of the coil springs the coils will be dragged one after the other into the terminal passageway until the clamping sleeve has been fully applied and such dragging action will also cause the coils to separate a distance so that the elastic force which tends to return them to normal position will aid in securing clean, rigid contact with the terminal walls. To disconnect, the sleeve is merely withdrawn to permit the spring action of the limbs to remove the spring coils from the terminal. During connection or disconnection neither the terminal or the metallic clamp element *c* need be touched as the conductor 10 is fully insulated and the sleeve 17 is of insulating material. The hands are thus protected against shock and from contact with acid. After removal of the clamp the terminal and coil springs can be readily cleaned of any acid that may have splashed thereon.

In Figs. 6 and 7 I have shown a simple arrangement for preventing withdrawal of the insulation sleeve beyond the clamp loop 11 to which the wires *w* of the conductor are secured. I have shown the inner end of the sleeve closed except for a diametral slot 30 through which the limbs 12 and 13 extend. The loop 11 being wider than the width of the slot, the sleeve can be drawn inwardly only until the walls adjacent the slot encounter the loops. The loops and the connection therewith of the conductor wires will thus always be protected within the sleeve. The slot also serves the purpose of preventing rotation between the sleeve and clamp element *c* and connections can therefore be made with greater certainty. The end 17′ of the sleeve can also be flared as shown and such flare will prevent the fingers from sliding off of the sleeve and into contact with the metallic clamp element *c*.

I thus produce a connecter which can be positively and safely manipulated to be connected with or disconnected from a terminal by the simple shifting of an insulated sleeve along the insulated conductor from which connection is to be made. So long as the sleeve is in clamping position it will be impossible for the connection to be broken and secure electrical connection is always assured. The conductor can be securely ap-

plied to the clamping element without the use of solder, the loops securely clamping the wires and retaining them against ordinary pulls to which the conductor will be subjected during use.

I do not desire to be limited to the exact construction, arrangement and operation shown and described as changes can be made which will still come within the scope of the invention.

I claim as follows:

1. The combination with an electrical conductor, of a sleeve of insulating material slidable thereon, and a clamping element, said clamping element being of V-shape and formed from a piece of spring wire and having a number of turns at its bend, the end of the conductor wire being received and clamped between said turns to be thereby electrically connected with the clamping element, the ends of the limbs of said clamping element being shaped to receive another conductor with which connection is to be made, said clamping element being expanded when said sleeve is shifted away from its limbs, and being closed when said sleeve is shifted along said limbs, said element when closed causing its ends to securely clamp said other conductors between them.

2. The combination with an insulated electrical conductor, of a sleeve of insulating material slidable thereon, and a clamping element bent intermediate its ends from a piece of spring wire, spring turns formed in the bend of said clamping element, the end of the conductor wire being received and clamped between turns to be thereby electrically connected with the clamping element, said limbs being normally swung apart but being brought together by said sleeve when said sleeve is slid along the conductor and said limbs, the ends of said limbs being shaped to receive and clamp a conductor with which connection is to be made when said limbs are brought together.

3. Connecter mechanism of the class described comprising a spring frame bent to V-shape from spring wire and having a plurality of turns at its bend between which are received the ends of a conductor from which connection is to be made, a sleeve of insulating material adapted to receive the conductor and to be slid thereon and along said frame to bring the frame limbs together, and contact ends for said limbs for clamping a conductor with which connection is to be made when said limbs are brought together.

4. Electrical connecter mechanism of the class described comprising two spring limbs connected together at one end and adapted at such end for connection with a conductor from which connection is to be made, the other ends of said limbs being deflected toward each other, conical coil springs surrounding such deflected ends and connected at their apexes to the inner ends of said deflected ends, and a sleeve slidable along said limbs to force them together and to bring said coil springs into engagement with a terminal with which connection is to be made.

5. An electrical connecter comprising terminal members and means for normally holding them apart, contact making coil springs at the ends of said terminal members extending axially toward each other, and means for bringing said members together.

6. An electrical connection comprising a terminal member having a passageway, a second terminal member, and a conical coil spring connected at its apex to the end of said second terminal member whereby when said second terminal member is inserted in the passageway in said first terminal member said conical spring will be drawn into said passageway.

7. An electrical connection comprising one terminal member having a passageway, a second terminal member, a conical coiled spring encircling said second terminal member and connected at its apex with the end of said terminal member, insertion of said second terminal member in said first terminal member causing said coiled spring to enter said passageway with its apex end in advance, said spring turns being of slightly greater diameter than the width of said passageway.

In witness whereof, I hereunto subscribe my name this 24th day of March, A. D. 1923.

ALONZO HOWARD.