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J. R. GIER, JR

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BATTERY CABLE CONNECTOR

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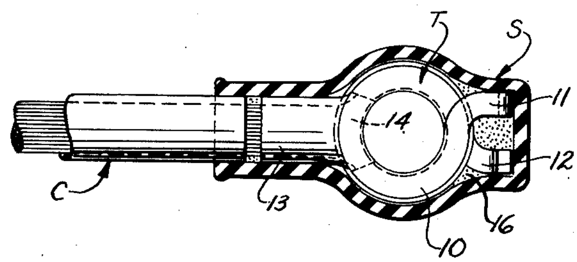

Fig. 1

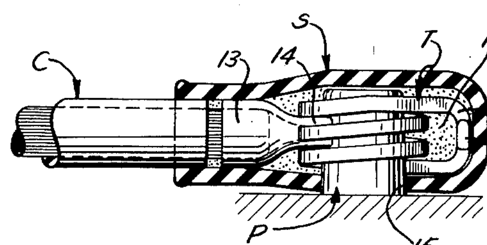

Fig. 2

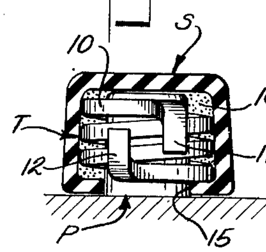

Fig. 3

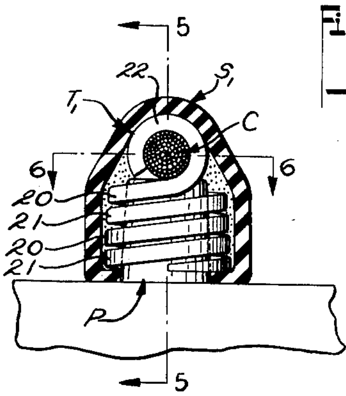

Fig. 4

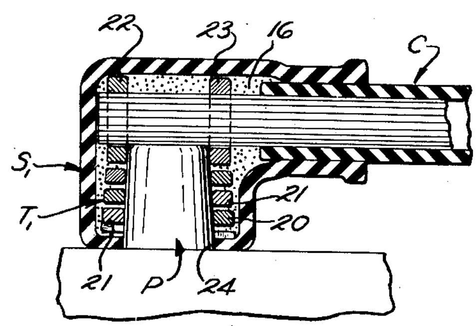

Fig. 5

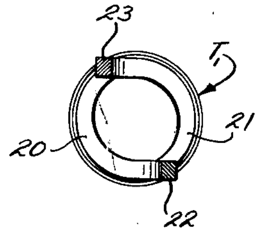

Fig. 6

INVENTOR.
JOHN R. GIER, JR.
BY
Rickey & Watts
ATTORNEYS

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BATTERY CABLE CONNECTOR

John R. Gier, Jr., Hudson, Ohio

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8 Claims. (Cl. 173—259)

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This invention relates to connectors, and more particularly to connectors or terminals employed to make electrical connection with the posts of storage batteries.

Storage batteries are low-voltage, high-current devices universally used as standard equipment for automotive service by the general public who give them very little care and considerable abuse but expect reliable performance from them. It is important that the connections to the battery post remain clean and tight and that the joint have a very low ohmic resistance. Battery connectors or terminals are subject to mechanical dislodgment as well as to the corrosive effects of moisture and acids, and corrosion not only increases the resistance of the joint but weakens the terminals mechanically. The corrosive effects of the gases emanating from the battery cells precludes adoption of any structure that is mechanically complicated or employs delicate moving parts.

As a result of these and many other problems incident to the employment of storage batteries, the trade has universally adopted the well-known split clamp and bolt type of construction, which is regarded as an expendable item because of its short life. Experience has shown that although such a clamp is relatively cheap to manufacture it leaves much to be desired relative to the solution of the problems briefly outlined above. Many attempts have been made by prior workers in the art to improve battery terminals but to my knowledge none of them have completely solved the problem nor have the devices been adopted in the trade, so that they fall in the category of prior attempts and failures.

In accordance with the present invention, however, the aforesaid problems and difficulties have been overcome by a terminal having the following features, advantages and characteristics:

(1) A terminal that provides a firm, resilient grip with the post, a grip that is mechanically strong and affords a permanent low resistance connection;

(2) A terminal that will accommodate post sizes normally encountered and yet will firmly and resiliently grip them all;

(3) A terminal that provides a grip of the character named in (1) above and wherein the gripping force is distributed over a large area of the post to avoid local deformation of the post;

(4) A terminal that is readily applied without need for manipulation of fasteners such as bolts or the like, the terminal cannot "freeze" to the post and only ordinary pliers are needed to apply or remove it;

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(5) A terminal that readily adapts itself to corrosion-protective shrouding, and may be applied and removed without disturbing the shrouding;

(6) A terminal, which although it has the above features and advantages is nevertheless as economical or more economical to manufacture than the standard clamp-type terminal now universally found in the trade, and which may reasonably be expected to last for the normal life of the car.

Briefly, in the broader aspects of the invention, the above features and advantages are obtained by making the terminal in the form of a tapered helical coil and by attaching a suitable cable connector to the coil, at a point more than one turn from either end of the coil. By making the coil of spring wire having good electrical conductivity and of the proper section, the tabulated features and advantages are readily obtained. The coil resiliently grips posts of normal size variation and yet the gripping action is accumulative, that is, it is distributed over a substantial area of the post so that although the total gripping force is adequate, the local gripping force is not great enough to damage or deform the battery post. The coil has a wraparound action which assists in the gripping action of the coil when it is rotated about the post in at least one direction.

A terminal of the general nature described requires no bolts, screws or the like and so may be readily shrouded to prevent the deleterious effects of corrosion. I am aware that prior attempts have been made to provide terminals that resiliently grip the battery posts, but these have all been in the form of relatively stiff cantilever-type springs, which if made stiff enough to provide the desired grip have inadequate accommodation to post size variations and which if made flexible enough to accommodate these post variations will not firmly grip any but the largest of posts. Moreover, such extremely stiff spring devices would be very difficult to apply and remove. Attempts have also been made to use rubber as the gripping medium, but rubber deteriorates rapidly in this service and relaxes its grip progressively with time.

It is a feature of a preferred form of my invention that once the terminal is applied any external torque or attempted rotation of the terminal about the post in either direction brings into play a wrapping action of the helical coil of wire and checks or snubs further rotation of the terminal. This is accomplished by mounting the cable connector at an intermediate point in the helix, there being at least one turn to each side of the connector. With this construction the portion of the coil to one side of the connector provides a wrapping action to resist rotation in one direction, and the portion of the coil to the other side of the connection functions in a like manner to resist rotation in the other direction. This form has an additional advantage in that the ends of the helix may be crossed whereby pliers or a similar tool may be applied to the ends of the coil to bring the ends together, expand the helix, and facilitate application and removal of the terminal. This operation may be effected directly through the shroud, if one is fitted to the terminal.

The manner in which the aforesaid objects and advantages may be accomplished will be more clearly understood from the following detailed description of a preferred embodiment of the invention.

In the drawings:

Figs. 1 to 3 show the preferred embodiment wherein Fig. 1 is a plan view with the shroud sectioned; Fig. 2 a side elevation showing the terminal applied to a battery post and with the shroud sectioned; and, Fig. 3 an end elevation with the shroud sectioned.

A modification appears in Figs. 4 to 6 wherein Fig. 4 is an end elevation with the device applied to a battery post; Fig. 5 is a side elevation of the device; and, Fig. 6 is a plan view with the cable removed and parts of the cable connecting eye broken away to show the direction of wind of the coils.

Referring to Figs. 1 to 3, it can be seen that I provide a terminal or connector T, which has soldered or otherwise fastened thereto the usual battery cable C, and the terminal may be enclosed by a shroud S of rubber-like material. In the preferred form the terminal T includes a single helical coil 10 of spring wire preferably wound with a slight taper so as to correspond in profile to the conventional battery post. I prefer that the helical coil be formed of a metal having good electrical conductivity and relatively high resistance to corrosion. Suitable materials for the coil may be selected from the commercial spring brasses and bronzes. In order to increase the torsional stiffness of the coil I prefer that the wire going to make up the helix be made of flattened round wire, although in some applications wire of circular section may prove satisfactory. In order to provide for ready application and removal of the connector the ends of the helix are crossed as shown at 11 and 12 and they may be bent axially to provide gripping surfaces for reception of tools such as pliers or the like.

The cable may be connected directly to the helix, or preferably a cable connector in the form of a sleeve or socket 13 may be employed. The sleeve is flattened as at 14 and soldered or welded to one of the coils of the helix. It is an important feature of the preferred form of the invention that the cable or the connecting sleeve, if such is employed, be attached to the helix at a point spaced at least one turn from each end of the coil. For example, in the preferred construction the helix includes three complete turns and the cable socket is connected to the midturn. With this construction it will be noted that the portion of the helix above the cable will tend to wrap around or snub against the post and effectively prevent relative rotation of the parts in one direction, whereas the other portion of helix acts to snub rotation in the other direction. Although I prefer that an odd number of turns be provided with the cable connecting to the midturn, in the broader aspects of the invention this is not necessary so long as the cable is connected at a point wherein it is spaced from the nearest end of the helix by more than one turn. The resilient gripping force is distributed substantially over the entire length of the battery post so that the unit load at any point is not high enough to damage the post, and yet the loading is accumulative so that the total gripping force is adequate to firmly retain the terminal on the post and to maintain a low resistance electrical connection.

The construction just described readily adapts itself to incorporation of a shroud S, which is preferably molded of a flexible, acid-proof material such as natural or synthetic rubber. The shroud is formed or molded to fit snugly about the terminal at its junction with the cable, and is formed with an opening 15 adapted to receive and make sealing engagement with the battery post P and exclude gases and moisture from the interior of the shroud. The shroud may be filled with an inert material 16 such as petroleum jelly to protect the parts and assist in the exclusion of corrosion-producing fluids.

Depending upon the nature of the service and the absence or presence of the shroud, I may apply to the terminal by dipping or plating a thin coating of acid-resistant metal such as lead; or a non-metallic coating such as rubber except on the post contact surface. The coating is thin enough so that it does not interfere with the resilient action of the helix.

In operation, the opposed radially extending ends 11 and 12 of the helix are gripped and brought together, thereby expanding the helix slightly so that it may be readily slipped over the battery post. Once the terminal ends are released the coil resiliently grips the post throughout the length of the helix and, as previously described, remains securely attached until the ends 11 and 12 are again forced toward one another. No separate manipulation of the shroud is required because the terminals 11 and 12 can be readily manipulated through the shroud.

In the form shown in Figs. 4 to 6, the terminal T_1 includes a double helix. The first helix 20 is of double pitch and is intertwined with the second helix 21, also of double pitch. The helix 20 has at its upper end an eye 22 for reception of the bared end of the battery cable C and helix 21 has a similar eye 23 spaced from eye 22 by approximately the diameter of the battery post P. As best seen in Fig. 6, the direction of wind of each helix is the same. In accordance with the principles discussed, the terminal and the cable end may be protected by a shroud S_1 having a post-receiving opening 24. As mentioned above, petroleum jelly or the like may act within the terminal to agument the corrosion-resistance properties of the device.

In operation the terminal T_1 is applied to the post and a simultaneously downward pressure and a slight twisting action in the direction of the wind of the coils are effected. This frictionally expands somewhat the coils so that they may be readily passed over the post. When the terminal is released the coils resiliently grip the post much in the manner described above, and the firm resilient grip of the coils is such as to retain the terminal in good electrical contact with the post under ordinary conditions.

When it is desired to remove the terminal it is again twisted in the direction of wind and merely lifted, whereupon it may be readily removed from the battery.

Having completed a detail description of my invention, it can be seen that I have produced a device which may be economically manufactured so that it is competitive with the conventional strap-like clamps now employed in the trade, yet the device has numerous advantages and new results not obtainable by the standard commercial clamps or by any other clamps found in the art. The grip against the post is firm enough to withstand all forces normally encountered and yet it is an accumulative grip so that at no point is the post unnecessarily deformed, and the device will accommodate a range of sizes of posts. Protective shrouding can be applied readily and the terminal connected to and removed from the battery without disturbing the shrouding.

These and other advantages will be apparent and have been described, and although a preferred embodiment of the invention has been described so that those skilled in the art may practice the invention, applicant contemplates that various changes and modifications may be made without departing from the essence of the invention. Accordingly, it is intended that the appended claims and not the aforesaid embodiments be determinative of the scope of my invention.

What is claimed is:

1. A battery terminal for effectively gripping and accommodating a battery post comprising an axially internally tapered helical coil of wire-like spring material having good electrical conductivity, each turn of which is of substantially smaller axial dimension than the post, said coil including an odd number of turns, no less than three, a cable extending from the midturn of said coil, whereby substantially half of the coil is tightened against the post when the terminal is rotated about the post in either direction, the ends of said wire-like material extending radially past the coil and crossing so that the coil is expanded when its ends are forced toward one another.

2. A battery terminal for effectively gripping and accommodating a battery post formed of relatively soft material comprising an axially internally tapered helical coil of wire-like spring material, said wire being of oblong section and having good electrical conductivity, each turn of said wire being of substantially smaller axial dimension than the post, said coil including an odd number of turns, no less than three, a cable extending from the midturn of said coil, whereby substantially half of the coil is tightened against the post when the terminal is rotated about the post in either direction, the ends of said wire-like material extending radially past the coil and crossing so that the coil is expanded when its ends are forced toward one another.

3. A battery terminal for effectively gripping and accommodating a battery post comprising a helical coil of wire-like spring material having good electrical conductivity, each turn of which is of substantially smaller axial dimension than the post, said coil including an odd number of turns, no less than three, a cable extending from the midturn of said coil, whereby substantially half of the coil is tightened against the post when the terminal is rotated about the post in either direction, the ends of said wire-like material extending radially past the coil and crossing so that the coil is expanded when its ends are forced toward one another.

4. A battery terminal for effectively gripping and accommodating a battery post formed of relatively soft material comprising an axially internally tapered helical coil of wire-like spring material having good electrical conductivity, each turn of which is of substantially smaller axial dimension that the post, said coil including three or more turns, a cable extending from said coil and spaced more than one turn from either end of said coil, whereby a substantial portion of the coil is tightened against the post when the terminal is rotated about the post in either direction, the ends of said wire-like material extending radially past the coil and crossing so that the coil is expanded when its ends are forced toward one another.

5. A battery terminal for effectively gripping and accommodating a battery post formed of relatively soft material comprising an axially internally tapered helical coil of wire-like spring material having good electrical conductivity, each turn of which is of substantially smaller axial dimension than the post, said coil including three or more turns, a cable extending from said coil and spaced more than one turn from either end of said coil, whereby a substantial portion of the coil is tightened against the post when the terminal is rotated about the post in either direction, the ends of said wire-like material extending radially past the coil and crossing so that the coil is expanded when its ends are forced toward one another, and a shroud of rubber-like material surrounding said terminal and including an opening for reception of a battery post.

6. A battery terminal for effectively gripping and accommodating a battery post formed of relatively soft material comprising an axially internally tapered helical coil of wire-like spring material having good electrical conductivity, each turn of which is of substantially smaller axial dimension than the post, said coil including an odd number of turns, no less than three, a cable extending from the midturn of said coil, whereby substantially half of the coil is tightened against the post when the terminal is rotated about the post in either direction, the ends of said wire-like material extending radially from the coil and crossing so that the coil is expanded when its ends are forced toward one another, and a shroud of rubber-like material surrounding said terminal and including an opening for closely fitting the battery post, said coil ends being manipulable through the shroud for application and removal of the terminal.

7. A quick attachable self-tightening electrical connector comprising a helical coil of resilient conductive metal, a cable rigidly connected to a portion of one turn of said coil, said coil extending for more than one turn from each side of the zone of cable attachment, said connector resiliently gripping a post and resisting rotation on said post in both directions, the ends of said coil terminating adjacent one another and having projections formed thereon for reception of means for expanding the coil.

8. A quick attachable self-tightening electrical connector comprising a helical coil of resilient conductive metal, a cable rigidly connected to a portion of one turn of said coil, said coil extending for more than one turn from each side of the zone of cable attachment, said connector resiliently gripping a post and resisting rotation

on said post in both directions, the ends of said coil terminating adjacent one another, and means projecting from the ends of said coil and diverging therefrom for reception of means for expanding the coil, the total number of turns represented by said coil and projecting means exceeding three, whereby said coil is expanded by bringing the terminal portions of said projecting means together.

JOHN R. GIER, JR.

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