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Wening

[11] **3,790,920**

[45] **Feb. 5, 1974**

[54] **BATTERY TERMINAL CONNECTOR AND HOUSING**

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[52] U.S. Cl. ..... **339/116 C**, 339/231, 339/237

[51] Int. Cl. **H01r 13/52**

[58] Field of Search 339/114–116, 224–240

[56] **References Cited**

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Attorney, Agent, or Firm—B. P. Fishburne, Jr.

[57] **ABSTRACT**

A battery terminal post receives a split connector cap of compatible metal and the cap is firmly clamped to one end of a battery cable. A housing element for the battery terminal post and connector cap is sealed around the post in a fluid-tight manner. A threaded clamping or pressure sleeve is received in a threaded bore of the housing element and exerts pressure on a rear face of the connector cap. The cap and interior of the housing element are configured to cause firm clamping of the split cap on the battery terminal post in response to the pressure exerted by said sleeve.

11 Claims, 9 Drawing Figures

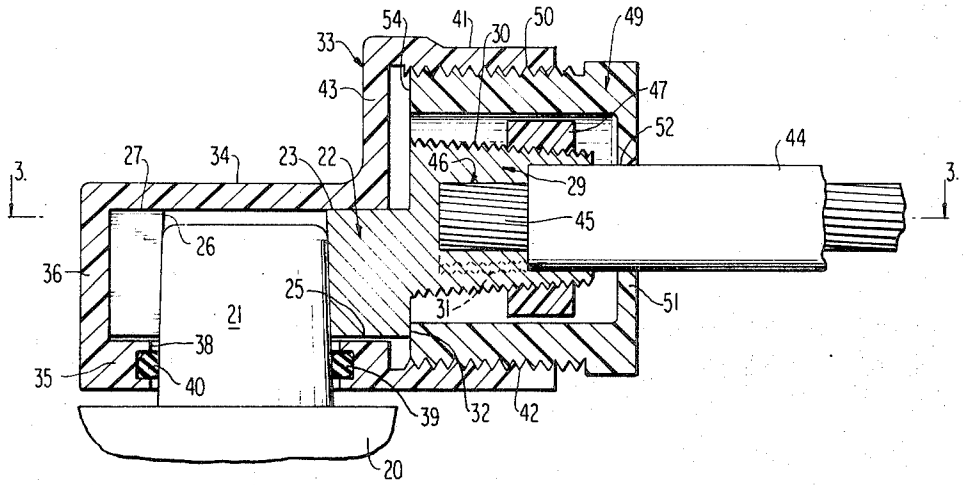
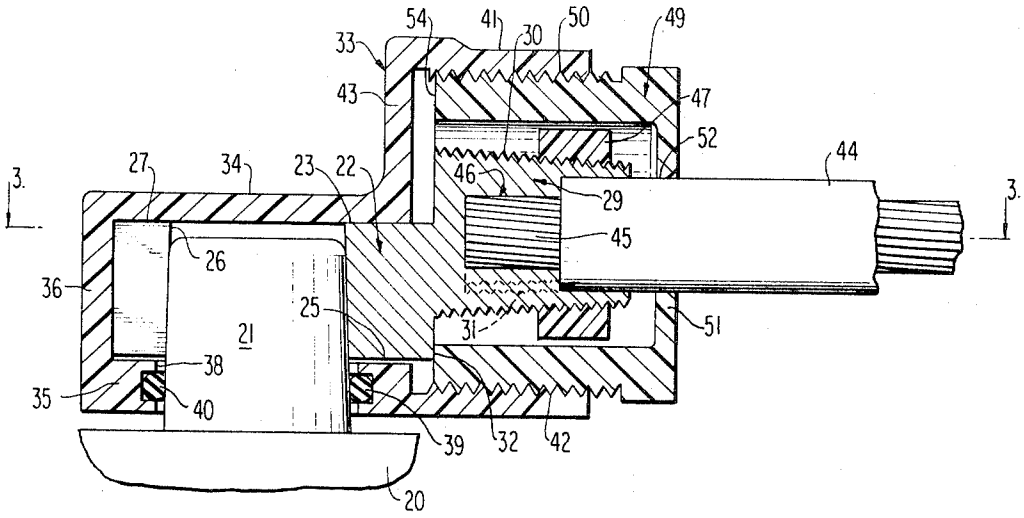


FIG.1


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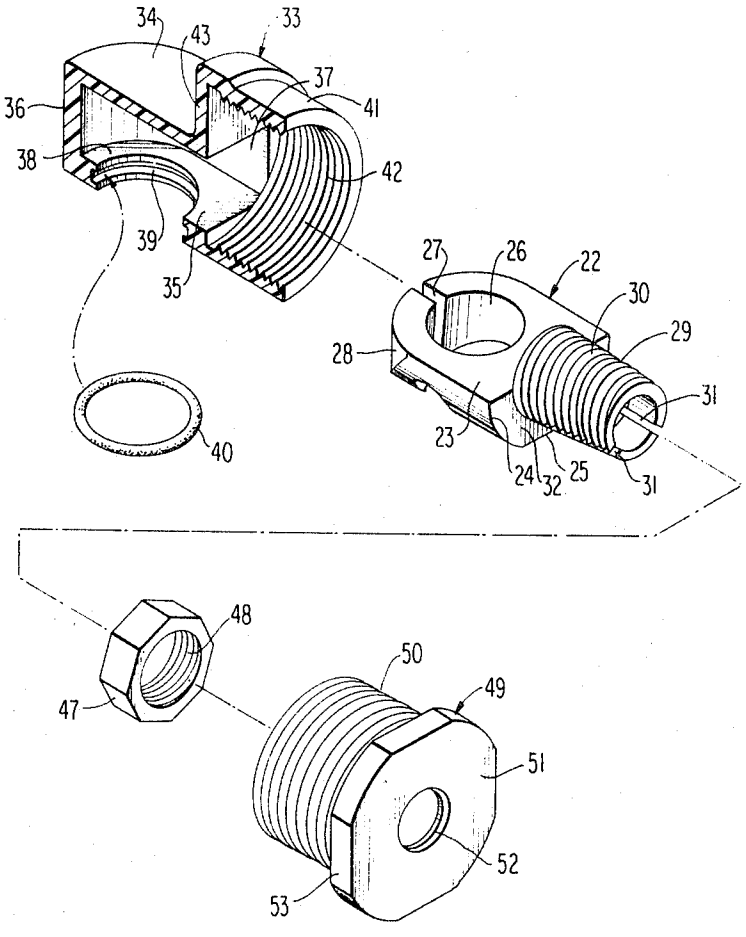

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FIG.2

FIG.3

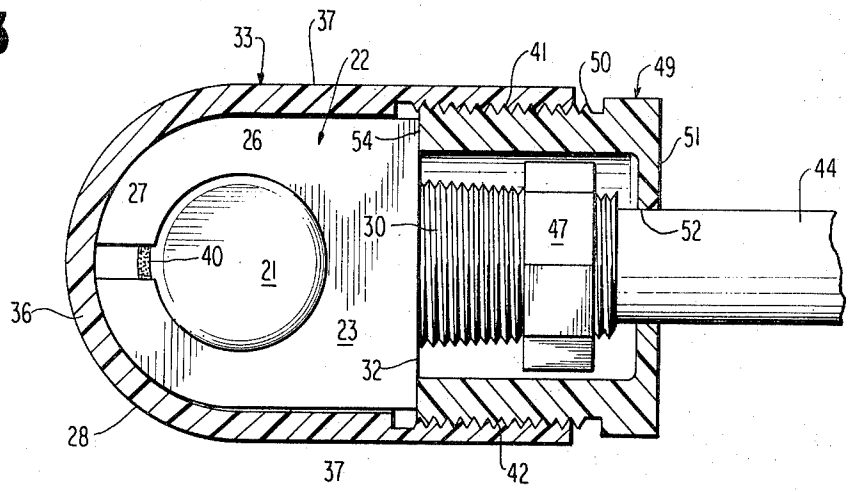


FIG.4

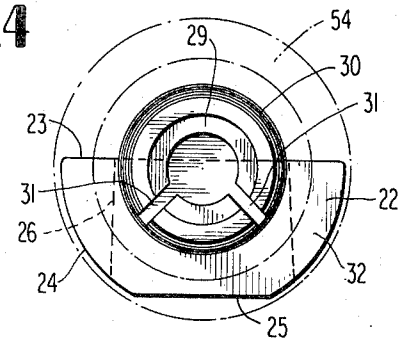


FIG.8

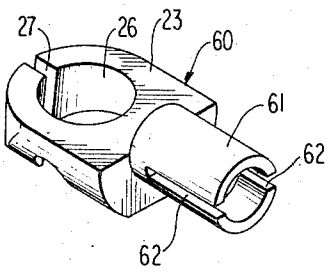


FIG.5

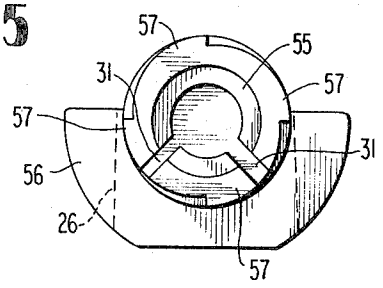
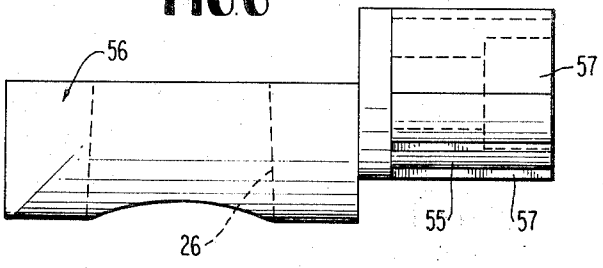


FIG.6



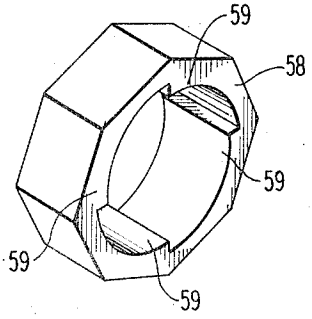


FIG.7

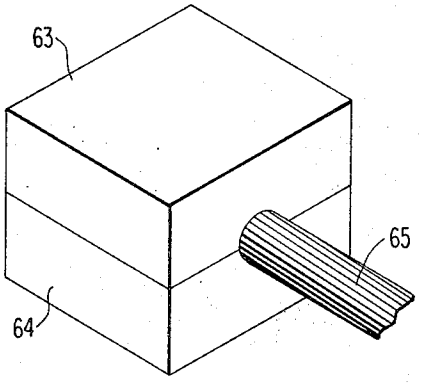


FIG.9

BATTERY TERMINAL CONNECTOR AND HOUSING

This application is an improvement on my prior copending application, Ser. No. 154,737, filed June 21, 1971, now U.S. Pat. No. 3,718,891, for Battery Terminal Connector And Housing Means.

The principal object of this invention is to improve upon the construction and efficiency of operation of a battery terminal connector and housing device of the class disclosed in the above-identified application. More particularly, the connector and housing embodying the present invention is considerably more compact, contains fewer major components, is formed of improved materials, and most importantly is constructed to produce a firmer and more secure electrical connection between the battery terminal post and connector cap and between the shank of the cap and the battery cable. To achieve this, the connector cap and certain interior wall surfaces of the non-conducting plastic housing element have been shaped in a certain manner so as to coact and cause increased binding or clamping of the cap onto the post as pressure exerted by the threaded pressure sleeve is gradually increased. Additionally, the overall geometry of the connector and housing device has been improved so that the force exerted by the pressure sleeve against the back of the connector cap occurs at the most advantageous point directly opposite the battery terminal post so as to result in the greatest degree of clamping or binding of the cap onto the post.

The provision of an O-ring seal between the housing element and terminal post further resists corrosion of the connection by excluding corrosive fumes from the housing element and also provides a slightly yielding connection between the post and housing element to relieve stresses in the housing element when the pressure sleeve is tightened down.

Other features and advantages of the improved device will be apparent during the course of the following detailed description.

BRIEF DESCRIPTION OF DRAWING FIGURES

FIG. 1 is a central vertical section through a battery terminal connector and housing device embodying the present invention.

FIG. 2 is an exploded perspective view, partly in section, showing the components of the device in FIG. 1 separated from the battery terminal post.

FIG. 3 is a horizontal cross section taken on line 3—3 of FIG. 1.

FIG. 4 is an end elevation of a connector cap with the engaging end face of the pressure sleeve shown in phantom lines.

FIG. 5 is an end elevation of a modified form of connector cap.

FIG. 6 is a side elevational view of the same.

FIG. 7 is a perspective view of a device for locking or clamping the cap in FIGS. 5 and 6 to an end portion of a cable.

FIG. 8 is a perspective view of another modified form of connector cap.

FIG. 9 is a schematic perspective of means for permanently attaching a connector cap to the end of a battery cable during manufacturing of the cable assembly.

DETAILED DESCRIPTION

Referring to the drawings in detail where like numerals designate like parts, attention is directed first to FIGS. 1 through 4 wherein an automotive type lead-acid storage battery 20 or the like has an upstanding exposed binding or terminal post 21, which, for the purpose of illustrating this invention, may be either the negative or positive battery terminal post. The connector and housing device embodying the invention comprises an antimony and lead conducting connector cap 22 having a connector head portion including a top flat face 23 and a cylindrically curved side wall 24. The bottom of the connector cap head has a flat 25 of reduced width compared to the face 23 and being parallel therewith. The cap head portion is provided centrally at right angles to the surfaces 23 and 25 with a slightly tapered through bore 26 to receive the battery terminal post 21 which is also tapered in matching degree. The forward end of the cap head is split or divided from top to bottom as indicated at 27 and this opening or slot in the head of the cap lies on the longitudinal center line of the assembly as shown in FIG. 2.

The forward end portion of the connector cap head is cylindrically rounded as shown at 28 and at the top face 23, FIG. 3, the frontal end of the cap head is substantially semi-cylindrical and concentrically formed with the through bore 26 and the axis of the post 21.

The connector cap 22 additionally embodies an integral rear end connector sleeve 29 which is provided externally with rearwardly tapering screw-threads 30. The connector sleeve 39 is longitudinally split or divided preferably at two points as shown at 31, and these points are preferably spaced apart 90° circumferentially as best illustrated by the end view of the cap, FIG. 4.

The back face 32 of the connector cap head is a flat face formed perpendicular to the upper flat face 23. As shown in FIG. 4, the face 32 surrounds the lower side of the sleeve 29 so as to provide an approximately semicircular arcuate flat engagement face for a pressure sleeve, to be described.

The device further comprises a non-conducting preferably clear plastic housing element 33. The housing element is preferably formed from a thermoplastic resin, such as Valox 420. This material is manufactured and sold by General Electric Company, Section 122, Plastics Department, One Plastics Ave., Pittsfield, Mass. 01201. This particular material is a very superior metal replacement plastic which is tough with high strength and high resistance to corrosion. The other plastic components of the invention, to be described, are preferably formed or molded from the same material.

The plastic housing element 33 has a main front chamber portion including a flat top wall 34, a parallel bottom wall 35 and a cylindrically curved front wall 36, all integrally joined. As shown in FIG. 3, the curvature of the housing wall 36 matches the curvature of the rounded face 28 of the connector cap head.

The housing element 33 also includes parallel longitudinal side walls 37 extending rearwardly of the arcuate front wall 36, FIG. 3, the described walls 34, 35, 36 and 37 defining a main chamber for the battery terminal post 21 and the head of connector cap 22 when the device is assembled.

The bottom chamber wall 35 has a circular opening 38 to receive the upstanding post 21 and the wall of opening 38 has an annular groove 39 for the seating of an O-ring seal 40 which snugly engages the periphery of the terminal post 21 and excludes moisture and corrosive fumes from the housing main chamber which receives the post and the connector cap 22, FIG. 1. The O-ring seal 40 serves another useful purpose in that it allows minute relative movement between the housing element 33 and the post 21 to relieve the housing element of stresses as the assembly is tightened in a manner to be described.

Rearwardly of its main front chamber, the housing element 33 has an annular sleeve extension 41 with internal screw-threads 42 extending to its rear open end. A transverse vertical wall 43 at the top of the housing element joins the wall 34 to sleeve extension 41. As best shown in FIG. 3, the sides of the sleeve extension 41 are integrally joined with the previously described longitudinal side walls 37. The construction is such that the upper portion of the sleeve extension 41 projects considerably above the top wall 34 of the main forward chamber and the width of this chamber, as viewed in FIG. 3, is approximately equal to the diameter of sleeve extension 41. The construction renders the device highly compact with substantially no unused internal space in the housing element 33 and this is a major improvement over the prior art in addition to the improved functional or operational features, to be described.

With reference to FIGS. 1 and 3, a conventional insulated battery cable 44 has one bare terminal end 45 socketed within a recess or bore 46 of connector sleeve 29. In order to tightly clamp the split sleeve 29 onto the cable, a nut 47 preferably formed of the aforementioned Valox plastic and having a tapered screw-threaded bore 48 is applied over the tapered threads 30 and tightened with a wedging action to draw the segments of the split sleeve 29 into tight clamping engagement with the cable end portion. This forms a very secure mechanical and electrical connection which will not tend to loosen under strain and vibration conditions to which automotive vehicles are constantly subjected.

The connector and housing device or assembly additionally comprises a rear end cap and pressure sleeve 49 having external screw-threads 50 which enter the threads 42 of the housing element. The cap or sleeve 49 has a rear end wall 51 provided with a central opening 52 which preferably has a snug fit over the insulation of the cable 44 to exclude fumes and contaminants. This forms an effective seal at the only other opening in the assembled device. The rearward end of the pressure sleeve 49 is equipped with wrench flats 53 to facilitate firm tightening into the threaded bore 42. The leading end face 54 of the pressure sleeve is square with the axis of the screw-threads and parallel with the rear flat face 32 of the connector cap head. FIG. 4 shows in phantom lines how the annular end face 54 of the pressure sleeve 49 abuts the rear end face 32 of the connector cap around a full half circumference of the assembly so that a firm and evenly distributed pressure is exerted on the back of the connector cap head directly across the terminal post 21 of the battery. This construction and geometrical arrangement is a very important and somewhat critical improvement feature which causes the tightest possible clamping action of the split head of connector cap 22 on the post 21 and the least likelihood that the parts, after being wedged into locking engagement, will ever separate due to vibrations of the magnitude encountered with automotive equipment. In this main respect, the invention is a substantial improvement over the construction in the aforementioned copending application.

When the sleeve 49 is gradually tightened against the end face 32 of the connector cap head, the rounded front end face 28 of the connector cap head receives a camming action and a wedging action from the opposing cylindrically curved end wall 36 of housing element 33, which end wall resists the pressure exerted by the presssure sleeve 49. Consequently, when the parts are sufficiently tightened, the split connector cap 22 will remain in firm clamping engagement with the battery post for a reliable and relatively permanent mechanical and electrical union. As stated, the resilient O-ring seal 40 serves to relieve the plastic housing element 33 from some of the stresses induced by the final locking and tightening of the components. The sleeve 49 is also formed from the same plastic, previously discussed in connection with other components.

The abutment of the flat face 23 and flat wall 34 prevents relative movement of the cap 22 and housing element 33 in a vertical direction or along the axis of the post 21. The assembled parts, as illustrated in FIG. 3, are all securely locked against relative movements along the axis of the cable 44.

FIGS. 5 through 7 depict a modification of the means for affixing the end of the battery cable 44 to the lead-antimony connector cap. In these figures, the split connector sleeve 55 of connector cap 56 is provided on its exterior with preferably four involute-type cam teeth 57, two of which are intersected by the previously described slots 31. A threadless nut-like tightening element 58, FIG. 7, having coacting involute cam teeth 59 is adapted to engage over the connector sleeve 55 and after this engagement, the element 58 is turned in the proper direction to cause the teeth 59 to coact with the relatively stationary teeth 57 so as to clench the split sleeve 55 tightly onto the end of the cable. This construction is an alternative arrangement for the previously described nut 47 and tapered screw-threads. In all other respects, the invention remains the same as to structure and operation as described in the previous embodiment.

FIG. 8 shows a further slight modification of the connector cap 60 wherein the cable connector sleeve extension 61 is divided into two semi-cylindrical portions by opposed longitudinal slots 62. The sleeve 61 is unthreaded both externally and interiorly and requires no nut or other clenching element. The divided sleeve 61 simply receives the terminal end of the battery cable 44 and is mechanically clenched firmly onto the same by a plier-type tool or a special clenching tool, no shown. In all other respects, the invention is identical to that shown in FIGS. 1 through 4.

FIG. 9 shows schematically how die or mold sections 63 and 64 may be employed in the manufacturing of a battery cable assembly 65 to initially and permanently attach thereto a lead-antimony connector cap which otherwise conforms to the shape or design of the cap 22.

It may be seen that a battery terminal connector and housing device is provided in the invention which will lengthen battery life by the avoidance of terminal corrosion and will greatly reduce or completely eliminate

the need for cable replacement. The terminal and cap housing is completely sealed and protected from corrosive contaminants and power loss due to corrosion and/or loose terminal connections and short circuits are virtually eliminated. Installation of the invention is very simple with no special skill required and a quick disconnect arrangement of the cap from the battery terminal post is automatically afforded by the invention. These are simply some of the main advantages, among others, which are achieved by the invention.

It is to be understood that the forms of the invention may be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

I claim:

1. A connector and housing for a battery terminal post comprising an electrical conducting connector cap for attachment to a battery terminal post, said connector cap having a head provided with a through bore to receive said post, the head having a rounded forward end and having a slot in such end intersecting said through bore, a connector sleeve extension on the rear of the head of said connector cap adapted for connection with a battery cable, said head of the connector cap having a rear end face which is flat and lies in a plane substantially parallel to the axis of said terminal post and extends in a substantially semi-circular arc around the connector sleeve extension, a non-conducting housing element for said connector cap and terminal post having a forward main chamber portion, said main chamber portion having a top wall, a substantially parallel bottom wall and a forward end arcuate wall approximately matching the contour of said rounded forward end of said head and a pair of side walls adapted to receive said head therebetween, said bottom wall having an opening adapted to receive said terminal post, an annular resilient seal seated within said opening and adapted to sealingly embrace said terminal post below the region of engagement of the post with the head of said connector cap, the housing element having a rearwardly open sleeve extension which is internally screw-threaded, said extension disposed rearwardly of the head of said connector cap, and an externally threaded pressure sleeve engageable within said sleeve extension and having a forward annular face adapted to abut said rear end face of the connector cap head substantially entirely around said semi-circular arc and in a region opposite to said housing forward end arcuate wall, whereby turning of said pressure sleeve in a direction to force said annular face against said rear end face of the connector cap head causes said housing forward end arcuate wall to wedge the connector cap head into tight clamping contact with said terminal post.

2. A connector and housing for a storage battery terminal post comprising an electrically conducting connector cap for attachment to a battery terminal post, said connector cap having a through bore to receive said terminal post and having an arcuate forward end, the arcuate forward end having a slot communicating with said through bore, said connector cap having a rearward extension adapted for connection with a storage battery cable, said connector cap having a substantially flat rear end face surrounding said extension in a substantially semi-circular arc and said rear end face lying in a plane substantially parallel to the axis of said through bore, a non-conducting housing element for said connector cap and terminal post including a main chamber to receive the connector cap and having a bottom wall opening to receive said post, said main chamber having an arcuate forward wall engageable with said arcuate forward end of the connector cap, said housing element having a rearward screw-threaded sleeve extension, and a screw-threaded pressure sleeve adapted to be coupled with said screw-threaded extension and having a forward end face lying in a plane parallel to said flat rear end face and abutting the same fully around said semi-circular arc in a region opposite to said terminal post, whereby tightening of said pressure sleeve relative to the housing element will force said connector cap into firm gripping engagement with said terminal post.

3. The structure of claim 2, and an annular fluid-tight seal within said bottom wall opening snugly engaging said terminal post.

4. The structure of claim 3, and said seal comprising an O-ring seal seated in an annular groove formed in the side wall of said bottom wall opening.

5. The structure of claim 2, and said connector cap rearward extension being an externally tapering screw-threaded extension and being split longitudinally, and a clamping nut element mountable upon said tapering screw-threaded extension to tightly clamp the extension on the terminal end of a battery cable, said pressure sleeve having an internal chamber forming a housing for said nut and tapering screw-threaded extension of the connector cap, whereby the connector cap is fully enclosed.

6. The structure of claim 2, and said connector cap rearward extension having a series of circumferentially spaced cam teeth of gradually increasing thickness in a radial direction, said rearward extension being split longitudinally, and a clamping device having internal circumferentially spaced coacting cam teeth applied over the teeth of said rearward extension and turned relative to said extension to force the latter into positive gripping engagement with a battery cable terminal end.

7. The structure of claim 2, and said connector cap rearward extension comprising a split tubular extension adapted to fit over the terminal end of a battery cable and adapted to be squeezed into permanent gripping engagement with said cable.

8. The structure of claim 2, and said connector cap having a flat top face, said housing element main chamber having an opposing flat top wall adjacent the top face of said connector cap and preventing relative turning of the housing element with respect to the connector cap on the approximate axis of the battery cable.

9. The structure of claim 2, and said housing element and pressure sleeve formed of Valox thermoplastic resin.

10. The structure of claim 9, and said housing element being transparent.

11. A connector and housing for battery terminal posts comprising a battery terminal connector cap formed of electrical conducting material and having an approximately semi-cylindrical forward end face and a through bore which is substantially concentric with said end face, said through bore engageable over an upstanding battery terminal post, said connector cap being split near its forward end to divide the cap into two clamping parts on opposite sides of said terminal

post, means for connecting the rearward end of said cap firmly to a battery cable terminal end, a housing element of durable plastics material for the battery terminal post and connector cap and having a chamber conforming substantially to the shape of the connector cap and receiving the connector cap in close fitting relationship, said chamber having a bottom wall opening receiving the upstanding battery terminal post so that the latter may enter the through bore of the connector cap, a rear end threaded sleeve extension on said housing element, and a threaded substantially hollow pressure sleeve engaged threadedly with said extension and forming an enclosure for said means, said pressure sleeve having a forward contact end, the rear of the connector cap having a flat face engaging said contact end around a substantial arcuate plane at the rear of the connector cap and opposite the terminal post and said semi-cylindrical end face, whereby tightening of said pressure sleeve upon the housing element causes the connector cap to tightly grip the terminal post.

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