Sept. 9, 1941. R. A. FUNK 2,255,553

ELECTRICAL CONNECTOR

Filed Sept. 26, 1938

FIG. 1.

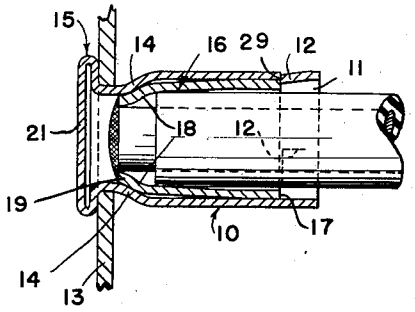


FIG. 2.

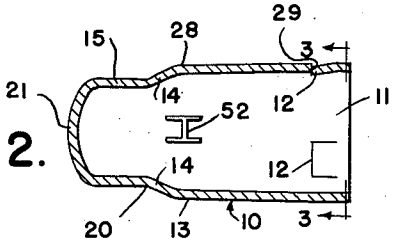


FIG. 3.

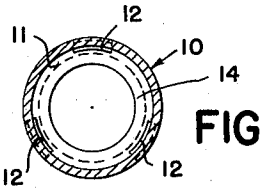


FIG. 4.

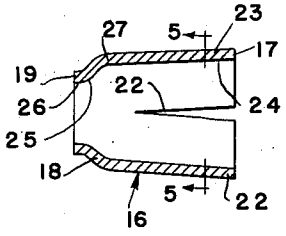
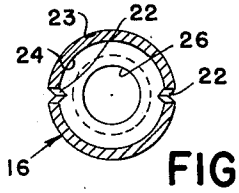


FIG. 5.



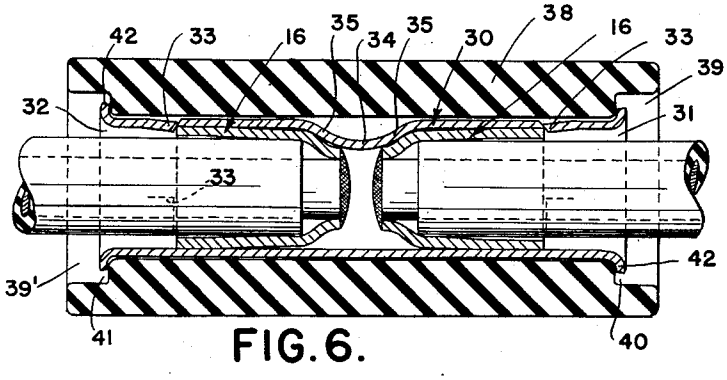


FIG. 6.

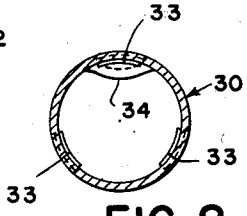


FIG. 8.

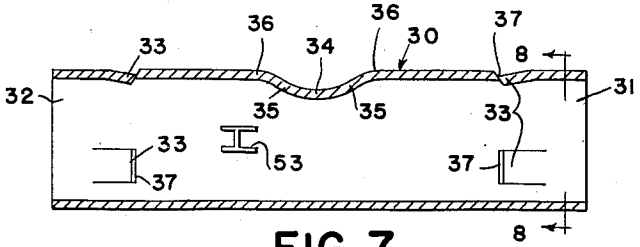


FIG. 7.

INVENTOR
RUSSELL A. FUNK
BY Whittemore, Hulbert & Belknap
ATTORNEYS

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ELECTRICAL CONNECTOR

Russell A. Funk, Detroit, Mich.

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3 Claims. (Cl. 173—328)

This invention relates to electrical connectors, and more especially deals with the provision of connectors for electrical systems of the type used in vehicles and the like.

The object of this invention is the provision of a one-piece electrical connector designed to increase the speed of assembly between different individual terminals in the vehicle.

It is a further object of this invention to provide an electrical connector designed to firmly lock a terminal insert in a manner to prevent removal of the same through jars and shocks absorbed by the vehicle. A still further object is to provide an electrical connector of fewer parts than those in present use, and capable of being more easily and better assembled than those used at the present time. In addition, it is the object of this invention to provide a terminal insert for such connectors capable of maintaining a frictional engagement with the connectors under variances in the diameter of the latter.

The general type of connector used prior to this time in the automotive field has had numerous problems, most of which arise out of the smallness of the article dealt with. The type generally used prior to this invention consisted of a terminal insert less than one-half an inch long and less than one-quarter of an inch in diameter. The terminal was provided with an outwardly tapering head with a recessed or crimped portion immediately back of the head. The connector commonly used is made up of three pieces. One, an inverted U-shaped member which was mounted in a slot in a dielectric mounting; two, extending through the slot was a metallic button maintained in place by a small spring member; three, the terminal was slipped through the U-shaped member and the button gave way during the insertion and then snapped back into the recess behind the head of the terminal. This minute construction was extremely difficult to assemble and because of the mechanical variances ever present, very frequently poor connections resulted due to weakness in the spring, a slipping of the button or an irregularity in the head portion of the terminal. This invention is directed to removing the shortcomings and expense involved in this type of terminal.

With reference to the drawing:

Figure 1 is a sectional view of an assembled connector mounted in a socket panel;

Figure 2 is a section of the connector portion before assembly into the panel;

Figure 3 is a sectional view taken on lines 3—3 of Figure 2;

Figure 4 is a sectional view of the terminal cap;

Figure 5 is a sectional view taken on lines 5—5 of Figure 4;

Figure 6 is a sectional view showing the modification of the socket portion used to electrically connect separate terminals;

Figure 7 is a sectional view of the socket portion showing the modification before assembly; and

Figure 8 is a sectional view taken on lines 8—8 of Figure 7.

With reference to the drawing more in detail, it will be seen that the electrical connector comprises a metallic tubing such as 10 having an open end 11 with an indent 12 stamped inwardly thereon to form a spring finger or lug. The tubing tapers inwardly from the open end thereof and terminates in a reduced cylindrical portion 15 connected to the tubular portion through the medium of tapered shoulders 14. The terminal or cap 16 is also of metallic tubing and tapers inwardly from the outer end 17 to the shoulders 18 where it then tapers sharply to form nose 19. These tapers respectively on the connector and the terminal are provided so that upon insertion of the terminal into the connector, the shoulders 18 will engage shoulders 14 and the outer ends 17 of the terminal will be gripped by lugs 12 to provide a firm contact between the two bodies.

In making the connector, I prefer to use drawn brass, bronze, or the like and to provide sufficient length for the reduced portion 18 to allow it to be upset after insertion through a switch panel such as 13 to firmly lock the connector in place in the panel. In my preferred form of connector there is also provided indents, such as 12 and 52, at spaced points on the connector. Each indent 12 is shown in the form of a lug struck inwardly in a manner to allow edge 29 thereof to engage the outer end 17 of the cap and lock the same within the connector. Indents 52 are shown in the form of a pair of opposed lugs stamped inwardly in the area of shoulder 14. Indents 52 take up any slack between the cap and connector and insure a good frictional engagement which in turn provides a good electrical contact between the cap and the connector.

In forming the cap portion 16, metallic tubing may be used of the same material as that mentioned for the connector, either drawn or formed from sheet material. On the side of the cap there are provided slots such as 22, which extend

from the end 17 inwardly a sufficient distance to give the cap 16 considerable flexing or compression qualities. These slots or grooves extend from the outer surface 23 through to the inner surface 24 of the cap. At the reduced end of the cap, at the inner surface thereof, a ledge 26 will be found. This ledge extends from the innermost end 25 of the portion 18 to the nose 19 to provide a flat surface to which wires may be soldered or otherwise secured to the cap.

After assembling the cap to suitable wires, the cap may be inserted in the connector 10. Since the diameter of the outer surface of the cap 16, at its outer end 17, is a few thousandths of an inch larger than the diameter of the connector, it is apparent that the cap can be put under tension which will force the outer edge 23 thereof into firm frictional engagement with the inner surfaces of the connector. As pointed out above, the addition of indents 12 and 52 will increase the special engagement and provide an extremely efficient electrical connection between the cap and the connector.

For the purposes of illustration, the approximate length of the cap from the outer end 17 to the nose 19 is one-quarter of an inch. The distance between the rearmost portion 27 of the shoulder 18 to the ends 17 is three-sixteenths of an inch. In the connector, the distance between the open end 11 and the base portion 21 is one-half inch, while the distance between the outermost edge 28 from the shoulders to the end 11 is five-sixteenths of an inch. The innermost edges 29 of the lugs 12 are one-sixteenth of an inch from the ends 11. The average diameter of the cap from the inner end 27 of the shoulder 18 to the outer end 17 is a few thousandths of an inch larger than the average diameter of the connector from point 28 to end 11. From the above referred to dimensions it will be apparent that when the shoulder 18 of the cap is seated against the shoulder 14 of the connector, lugs 12 of the connector will engage portions of end 17 of the cap, so that in addition to the frictional engagement between the walls of the cap and the connector, the cap will be firmly locked in place within the connector in a manner to prevent anything but deliberate and intentional removal of the same.

With respect to the modification shown in Figures 6 to 8, it will be apparent that the same principle is involved as that of the aforementioned construction. The cap 16 is exactly the same. The connector differs in that both ends of the tube are open to allow the insertion of caps at both ends thereof when the connector is desired to be used as a line connector instead of a terminal connector.

As herein shown, the connector 30 is made of metallic tubing approximately thirteen-sixteenths of an inch in length having both ends open as at 31 and 32. A plurality of indents 33 are provided in approximately the same manner as that shown in the preferred form. The difference being that the edge 37 of the indent is tapered so that in removing the cap from the connector it will give under less pressure than that shown in the preferred form for indent 12. By crimping the approximate center of the tubing, as at 34, shoulders 35 are provided for the same purpose as shoulder 14 in the preferred form. The distance between the outer edge 36 of the shoulder and the inner edge 37 of the indent is approximately the same as that allowed in the connector 10 between the edges 28 and 29, so that the cap 16 will seat and be locked in the connector 30 in the same manner as in connector 10. In addition, it will be noted that indents, such as 53, of the same construction as that shown for indents 52 are provided on the connector in the area of shoulders 35. Since connector 30 is exposed, and is normally positioned where short circuiting is possible, a dielectric tubing such as 38 is provided having both ends open as at 39 and 39'. In addition, the ends of the tubing are recessed as at 40 and 41 to provide a seat for the outer ends 31 and 32 respectively of the connector.

The diameter of the inner surface of the tube between the recesses 40 and 41 is sufficiently great to allow the insertion of the connector 30. After insertion of the connector in the tubing, ends 31 and 32 of the connector are crimped or flanged over as at 42 within the recesses 40 and 41 to firmly lock the connector within the tubing in a manner to prevent the entire connector 30 from being removed from tube 38.

It will be apparent from the foregoing description that there is disclosed a highly efficient and economical connector which can be made of several materials and of various shapes and sizes without departing from the scope of this invention.

What I claim as my invention is:

1. A connector for an electrical conductor in the form of an insulated cable having the insulation removed from one end portion, said connector comprising a terminal cap of tubular construction adapted to receive the end of the conductor from which the insulation is removed and having one end reduced and secured in electrical contact with the bare end of the conductor, a tubular metal body for receiving the terminal cap and having a reduced portion adapted to electrically contact the reduced end of the terminal cap, said cap having a portion of greater external diameter than the internal diameter of the body to insure contact therebetween, and an internal shoulder on the body engageable with the end of the cap opposite the reduced end of the latter to secure said cap in the body with the reduced portion of the cap abutting the reduced portion of the body.

2. A connector for an electrical conductor in the form of an insulated electrical cable having the insulation removed from one end, said connector comprising a terminal cap of tubular construction adapted to receive the end of the conductor from which the insulation is removed and having one end reduced to receive the bare end of the electrical conductor, said reduced end being secured in electrical contact with the bare end of the electrical conductor, a tubular metal body for receiving the terminal cap and having a reduced portion adapted to electrically contact the reduced end of the terminal cap, and a tongue struck inwardly from the body in axially spaced relationship to the reduced portion of the body, said tongue adapted to be flexed outwardly by the terminal cap upon telescoping the latter in the body and adapted to return to its innermost position in engagement with the end of the terminal cap opposite the reduced end of the latter to secure said cap in the body with the reduced end of the cap abutting the reduced portion on the body.

3. A connector for an electrical conductor in the form of an insulated electrical cable having the insulation removed from one end, said connector comprising a terminal cap in the form of a spring metal sleeve adapted to receive the end

of the conductor from which the insulation is removed and having one end reduced and secured in electrical contact with the bare end of said conductor, a tubular metal body adapted to telescopically receive the terminal cap and having a reduced portion forming an abutment for engagement with the reduced end of the terminal cap, the end of the terminal cap opposite the reduced end having a diameter greater than the internal diameter of the body and having a slit extending longitudinally from the latter end to a point intermediate the ends of the cap permitting the cap to be secured under tension in the body, and a shoulder on said body engageable with the end of the terminal cap opposite the reduced end of the latter to secure the terminal cap in the body with the reduced end thereof abutting the reduced portion of the body.

RUSSELL A. FUNK.