Oct. 23, 1956 C. A. AQUILLON ET AL 2,768,361

CONNECTORS

Filed July 1, 1955

FIG. 1

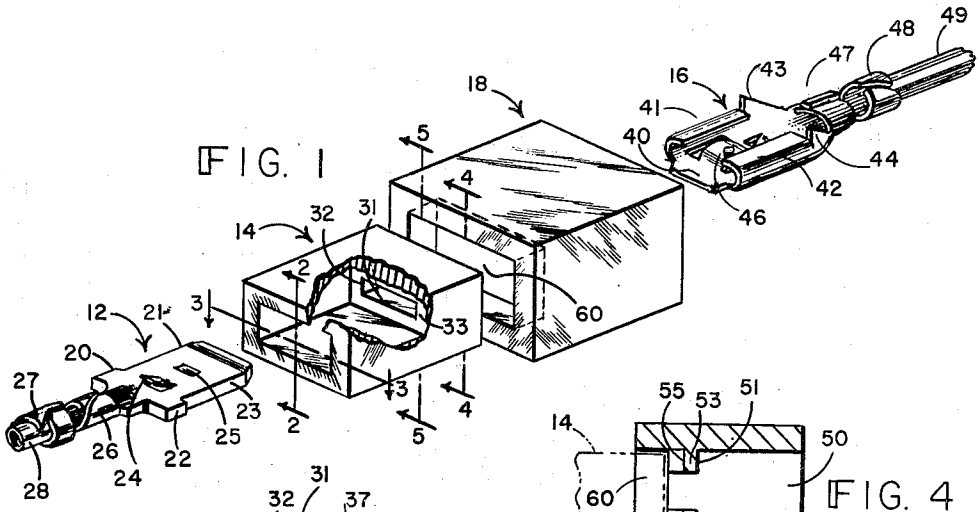


FIG. 2

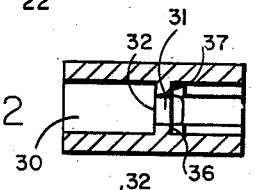


FIG. 3

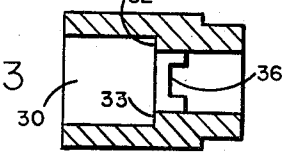


FIG. 4

FIG. 5

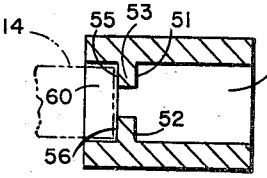


FIG. 6

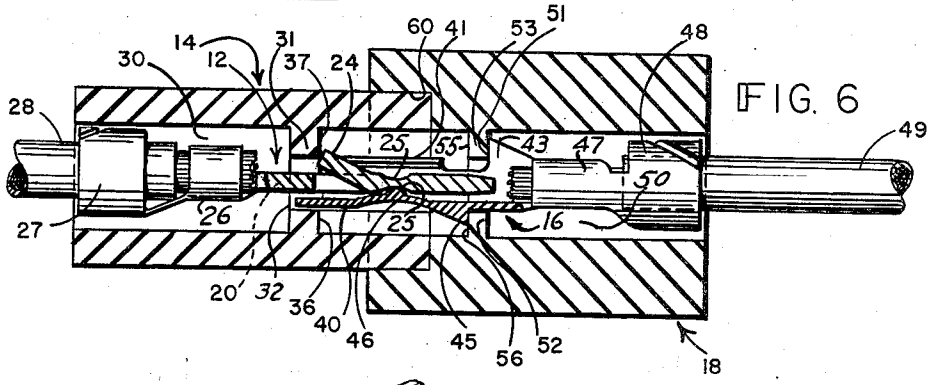
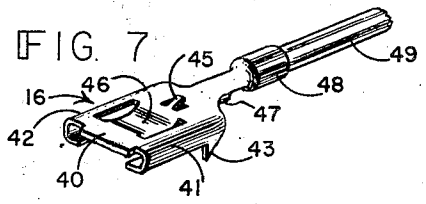


FIG. 7



United States Patent Office 2,768,361 Patented Oct. 23, 1956

2,768,361

CONNECTORS

Charles A. Aquillon, West Newton, and Stafford E. Davis, Newtonville, Mass., assignors to Ark-Les Switch Corporation, Watertown, Mass., a corporation of Massachusetts

Application July 1, 1955, Serial No. 519,326

7 Claims. (Cl. 339—211)

This invention relates to electrical connecting means and, more particularly, to electrical line connectors for providing a quickly and easily attachable, yet permanent, electrical connection between two or more electrical lines or circuits.

It is an object of the invention to provide a connector including a pair of cooperating metallic connector elements adapted to be interlocked to provide an electrical connection between two current conducting wires, and a pair of interlocking hollow sleeves of molded plastic insulating material in which said connector elements may be readily mounted. Thus, stops are provided within the hollow sleeves for locking each of the elements within its sleeve, the sleeves being locked together by the interlocking of the connector elements to provide a permanent, insulated electrical connection.

It is a particular feature of the invention that a novel sleeve structure is provided whereby the electrical connector element may be inserted therein in either of two positions. This feature is a great aid in the rapid assembly of connector elements within their insulating sleeves since, by the use of the present invention, it is no longer necessary to select the proper right-side-up position for insertion of the connector element within its sleeve—the up-side-down position will do as well. Similarly, the insulating sleeves with the connector elements mounted therein may be assembled in either a right-side-up or up-side-down position.

Further objects and features of the present invention will be apparent from the following description, reference being made to the accompanying drawings, wherein is shown a preferred embodiment of the invention.

In the drawings:

Fig. 1 is an exploded isometric view of the electrical connector of the invention showing each of the electrical connector elements and each of their sleeves;

Figs. 2 through 5 are cross-sectional views of the insulating sleeves of Fig. 1 taken on the lines 2—2 through 5—5 thereof;

Fig. 6 is an enlarged cross-sectional view of the structure of Fig. 1 in interlocked position; and

Fig. 7 is an isometric view of one of the connector elements of Fig. 1.

Referring to the drawings, the complete electrical line connection of the present invention consists of four elements; a spade connector element generally designated 12, a hollow sleeve, generally designated 14, of molded plastic insulating material for housing said element 12, a socket connector element generally designated 16, and a hollow sleeve generally designated 18 of molded plastic insulating material for housing said element 16, each of said connectors being positively, although releasably, retained in its housing, and being adapted for releasably interlocking engagement with the other connector to hold said connectors and housings together, both to provide an electrical connection between the connectors, and to insulate and protect the exposed metal of the connectors.

More specifically, the spade connector element 12 is

stamped from a flat metal strip preferably with a somewhat pointed front end (to the right in Fig. 1) and has a pair of abutments 20, 22 extending laterally outwardly from the side edges 21, 23 of said strip adjacent the rear end thereof. An outwardly and rearwardly extending yieldable tang 24 is provided struck out of said strip between the side edges 21, 23 adjacent the rear thereof, the struck out end of said tang being positioned forwardly (to the right in Figs. 1 and 6) of the forward end of abutments 20, 22. Complementary locking depressions 25 are provided in each flat side of element 12 between the side edges forward of said tang. The rear end of element 12 is deformed to provide a pair of integral U-shaped sections 26, 27 to receive, respectively, the bared ends and the insulating cover of a wire 28. The arms of sections 26, 27 are clamped against the bare end and insulation, respectively, to hold the wire in assembled relation with the spade connector element 12.

A hollow sleeve 14 of insulating material, such as molded plastic, is provided for housing said spade connector element 12, with the latter releasably retained in said housing. Thus, sleeve 14 has a through passage 30 of rectangular cross section, and is provided with an inwardly extending peripheral rib 31 forming a first pair of stops 32, 33 on its opposite side walls for engagement with the abutments 20, 22 of said spade connector element 12 to limit forward movement of said element relative to said sleeve as it is inserted into the rear end of said passage, the other side of said rib forming a second pair of stops 36, 37 for engagement of one thereof with the struck out end of said spade connector tang 24 to limit rearward movement thereof after forward movement of said spade connector element has moved said tang end past said second pair of stops 36, 37. The particular stop that is engaged will be dependent upon whether the spade connector 12 be inserted in a right-side-up position as shown or an up-side-down position in sleeve 14.

When it is desired to assemble the spade member 14 within the sleeve 16, the spade member is inserted from the left (Figs. 1 and 6) until abutments 20, 22 engage stops 32, 33. When that happens, the free end of tang 24 will snap into engagement with one of stops 36, 37. With tang 24 thus snapped into position, relative movement of the elements is prevented and the spade connector 12 will be retained within its insulating sleeve 14. When it is desired to disassemble the elements, the tang is made free of the stop 36, 37 with which it is engaged by inserting a tool and lifting the free end of tang 24 out of engagement with said stop, whereupon the spade connector 12 can be pulled to the left.

To cooperate with spade connector element 12 to provide an electrical connection, a socket connector element 16 is provided, said element comprising a one-piece member stamped from sheet metal. The element includes a base 40, preferably with a pointed front end (to the left in Fig. 1) with side flanges 41, 42 bent at right angles from the plane of the base and then bent inwardly back over one side of the base toward said base to provide terminal edges parallel with the base for engaging connector element 12. A pair of abutments 43, 44 are provided on said flanges extending outwardly from said flanges, at right angles to the plane of said base, and said abutments extend beyond said flanges near the rear end thereof.

Base 40 has an outwardly and rearwardly extending tang 45 struck out of said base between the flanges 41, 42 adjacent the rear thereof, said tang extending in a direction away from said flanges so that its free end is not positioned on the side between the flanges. Preferably, a locking detent 46 is also struck out of said base between said flanges forward of said tang and extend-

ing in the same direction as said flanges, said detent and said flanges cooperating with the side edges and one of said depressions in the spade connector element **12** to lock said connector elements together. Again due to the presence of complementary depressions in the spade connector element, the two elements may be interlocked in the right-side-up position as shown, or in an up-side-down position.

The end of base **40** is deformed to provide a pair of integral U-shaped sections **47**, **48** to receive respectively, the bared ends and insulating cover of a wire **49**. The arms of sections **47**, **48** are clamped against the bare end and insulation respectively, to hold the wire in assembled relation with the socket member **16**. A hollow sleeve **18** of insulating material is provided for socket connector element **16**, said sleeve being similar to spade connector element sleeve **14** and having a through passage **50** provided with an inwardly extending rib **53** forming a first pair of stops **51**, **52** for engagement with the abutments **43**, **44** of said socket connector element to limit forward movement of said element relative to said sleeve, and a second pair of stops **55**, **56** for engagement of one thereof with the struck out end of the socket connector tang **45** to limit rearward movement thereof after forward movement of said socket connector element has moved said tang end past said second stops.

To assemble the socket connector element **16** with its sleeve **18**, said element is inserted from the right end of the sleeve **18** until the ends of abutments **43**, **44** engage one of stops **51**, **52**. When that happens, the free end of tang **45** will snap downwardly into engagement with one of stops **55** or **56** to lock the socket connector element **16** in place within sleeve **18**. As before, the assembly may take place with the members in either position. Also, it may be readily disassembled, as explained above with reference to the spade connector element **12** and its sleeve **14**.

With each of the connector elements **12**, **16** retained in its respective sleeve **14**, **18**, the electrical line connection of the invention may be assembled by pressing the front ends of said sleeves together to interlock the connector elements, said sleeves being releasably retained with their forward ends adjacent one another by the interlocking of said connector elements. Preferably, the forward ends of one of said hollow sleeves **14** is positioned within the forward end of the other of said sleeves **18**, the latter sleeve being provided with a suitable recess **60** to receive the outside of said sleeve **16**, such arrangement aiding in providing an insulated housing for the exposed metal connection elements.

The connector elements together with their sleeves may be readily disassembled by pulling them apart by the application of sufficient force to spring detent **46** out of its retaining depression **25**.

Thus, it will be seen that the invention provides a novel line connector assembly which fully protects and insulates the exposed metal connector elements, and one in which each assembly operation may take place without regard to the up-side-down or right-side-up position of any of the elements. Various modifications within the spirit of the invention and the scope of the appended claims will be apparent to those skilled in the art.

We claim:

1. An electrical connection including a spade connector element comprising a flat metal strip having abutment means extending outwardly from said strip and an outwardly extending tang struck out of said strip, a hollow sleeve of insulating material for said spade connector element, said sleeve having a through passage provided with a first stop means for engagement with the abutment means of said spade connector element to limit forward movement of said element relative to said sleeve, and a second stop means for engagement with the struck out end of said spaced connector tang to limit rearward movement thereof after forward movement of said spade connector element has moved said tang end past said second stop means, a socket connector element comprising a one-piece member of sheet metal having a base with side flanges bent inwardly toward said base to provide spaced connector engaging edges, abutment means extending outwardly from said member and an outwardly extending tang struck out of said base and a hollow sleeve of insulating material for said socket connector element, said sleeve having a through passage provided with a first stop means for engagement with the abutment means of said socket connector element to limit forward movement of said element relative to said sleeve and a second stop means for engagement with the struck out end of said socket connector tang to limit rearward movement thereof after forward movement of said socket connector element has moved said tang end past said second stop means, to provide an insulated housing for the metal connector elements.

2. An electrical connection including a space connector element comprising a flat metal strip having abutment means extending outwardly from said strip, and an outwardly and rearwardly extending tang struck out of said strip between the side edges, a hollow sleeve of insulating material for said spade connector element, said sleeve having a through passage with an inwardly extending peripheral rib means providing a first stop means for engagement with the abutment means of said space connector element to limit forward movement of said element relative to said sleeve, and a second stop means for engagement with the struck out end of said spade connector tang to limit rearward movement thereof after forward movement of said spade connector element has moved said tang end past said second stop means, a socket connector element comprising a one-piece member of sheet metal having a base with side flanges bent inwardly toward said base to provide spade connector engaging edges, abutment means extending outwardly from said flanges and an outwardly and rearwardly extending tang struck out of said base between the flanges and extending in a direction away from said flanges, and a hollow sleeve of insulating material for said socket connector element, said sleeve having a through passage with an inwardly extending peripheral rib means providing a first stop means for engagement with the abutment means of said socket connector element to limit forward movement of said element relative to said sleeve, and a second stop means for engagement with the struck out end of said socket connector tang to limit rearward movement thereof after forward movement of said socket connector element has moved said tang end past said second stop means to provide an insulated housing for the interlocked metal connector elements.

3. An electrical connection including a spade connector element comprising a flat metal strip having abutment means extending outwardly from said strip, an outwardly and rearwardly extending tang struck out of said strip between the side edges, and complementary locking depressions in each flat side thereof between the side edges, a hollow sleeve of insulating material for said spade connector element, said sleeve having a through passage provided with a first pair of stop means for engagement of one thereof with the abutment means of said spade connector element to limit forward movement of said element relative to said sleeve, and a second pair of stop means for engagement of one thereof with the struck out end of said spade connector tang to limit rearward movement thereof after forward movement of said spade connector element has moved said tang end past said second stop means, a socket connector element comprising a one-piece member of sheet metal having a base with side flanges bent inwardly toward said base to provide spade

connector engaging edges, abutment means extending outwardly from said flanges, an outwardly and rearwardly extending tang struck out of said base between the flanges and extending in a direction away from said flanges, and a locking detent struck out of said base between the flanges forward of said tang and extending in the same direction as said flanges, said detent and said flanges cooperating with the side edges and one of said depressions in said spade connector element to lock said connector elements together, a hollow sleeve of insulating material for said socket connector element, said sleeve having a through passage provided with a first pair of stop means for engagement of one thereof with the abutment means of said socket connector element to limit forward movement of said element relative to said sleeve, and a second pair of stop means for engagement of one thereof with the struck out end of said socket connector tang to limit rearward movement thereof after forward movement of said socket connector element has moved said tang end past said second stop means, said sleeves being releasably retained with their forward ends adjacent one another by interlocking of said connector elements to provide an insulated housing for the metal connection elements.

4. An electrical connection including a spade connector element comprising a flat metal strip having a pair of abutments extending outwardly from the side edges of said strip adjacent the rear end thereof, an outwardly and rearwardly extending tang struck out of said strip between the side edges adjacent the rear end thereof and complementary locking depressions in each flat side thereof between the side edges forward of said tang, a hollow sleeve of insulating material for said spade connector element, said sleeve having a through passage with an inwardly extending peripheral rib providing a first pair of stops for engagement of one thereof with the abutments of said spade connector element to limit forward movement of said element relative to said sleeve, and a second pair of stops for engagement of one thereof with the struck out end of said spade connector tang to limit rearward movement thereof after forward movement of said spade connector element has moved said tang end past said second stops, a socket connector element comprising a one-piece member of sheet metal having a base with side flanges bent inwardly toward said base to provide spade connector engaging edges, a pair of abutments extending outwardly from said flanges adjacent the rear end thereof, an outwardly and rearwardly extending tang struck out of said base between the flanges adjacent the rear end thereof and extending in a direction away from said flanges, and a locking detent struck out of said base between the flanges forward of said tang and extending in the same direction as said flanges, said detent and said flanges cooperating with the side edges and one of said depressions in said spade connector element to lock said connector elements together, a hollow sleeve of insulating material for said socket connector element, said sleeve having a through passage with an inwardly extending peripheral rib providing a first pair of stops for engagement with the abutments of said socket connector element to limit forward movement of said element relative to said sleeve, and a second pair of stops for engagement of one thereof with the struck out end of said socket connector tang to limit rearward movement thereof after forward movement of said socket connector element has moved said tang end past said second stop, said sleeves being releasably retained with their forward ends adjacent one another by interlocking of said connector elements, with the forward ends of one of said hollow sleeves being positioned within the forward end of the other of said sleeves, to provide an insulated housing for the interlocked metal connector elements.

5. A socket connector element comprising a one-piece member of sheet metal having a base with side flanges bent inwardly toward said base to provide spade connector engaging edges, a pair of abutments extending outwardly from said flanges adjacent the rear end thereof, an outwardly and rearwardly extending tang struck out of said base between the flanges adjacent the rear end thereof and extending in a direction away from said flanges, and a locking detent struck out of said base between the flanges forward of said tang and extending in the same direction as said flanges.

6. An insulated electrical connector including a spade connector element comprising a flat metal strip having a pair of abutments extending outwardly from the side edges of said strip adjacent the rear end thereof, an outwardly and rearwardly extending tang struck out of said strip between the side edges adjacent the rear end thereof, and complementary locking depressions in each flat side thereof between the side edges forward of said tang, and a hollow sleeve of insulating material for said spade connector element, said sleeve having a through passage with an inwardly extending peripheral rib providing a first pair of stops for engagement with the abutments of said spade connector element to limit forward movement of said element relative to said sleeve, and a second pair of stops for engagement of one thereof with the struck out end of said spade connector tang to limit rearward movement thereof after forward movement of said spade connector element has moved said tang end past said second stops to releasably mount said spade connector element within said hollow sleeve.

7. An insulated electrical connector including a socket connector element comprising a one-piece member of sheet metal having a base with side flanges bent inwardly toward said base to provide spade connector engaging edges, a pair of abutments extending outwardly from said flanges adjacent the rear end thereof, an outwardly and rearwardly extending tang struck out of said base between the flanges adjacent the rear end thereof and extending in a direction away from said flanges, and a locking detent struck out of said base between the flanges forward of said tang and extending in the same direction as said flanges, and a hollow sleeve of insulating material for said socket connector element, said sleeve having a through passage with an inwardly extending peripheral rib providing a first pair of stops for engagement with the abutments of said socket connector element to limit forward movement of said element relative to said sleeve, and a second pair of stops for engagement of one thereof with the struck out end of said socket connector tang to limit rearward movement thereof after forward movement of said socket connector element has moved said tang end past said second stop to releasably mount said socket connector element within said hollow sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

2,640,970	Falge	June 2, 1953
2,682,040	Batcheller	June 22, 1954