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MALE CONNECTOR TERMINAL AND INSULATOR

Filed May 26, 1969

2 Sheets-Sheet 1

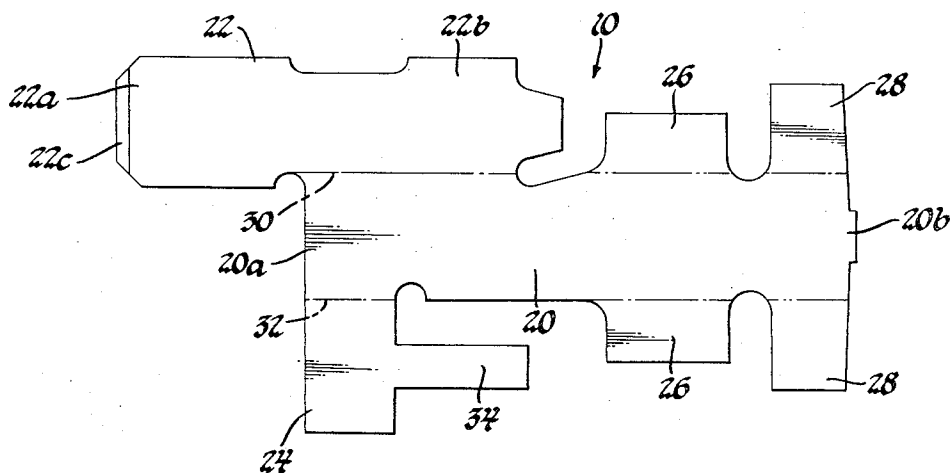


Fig. 1

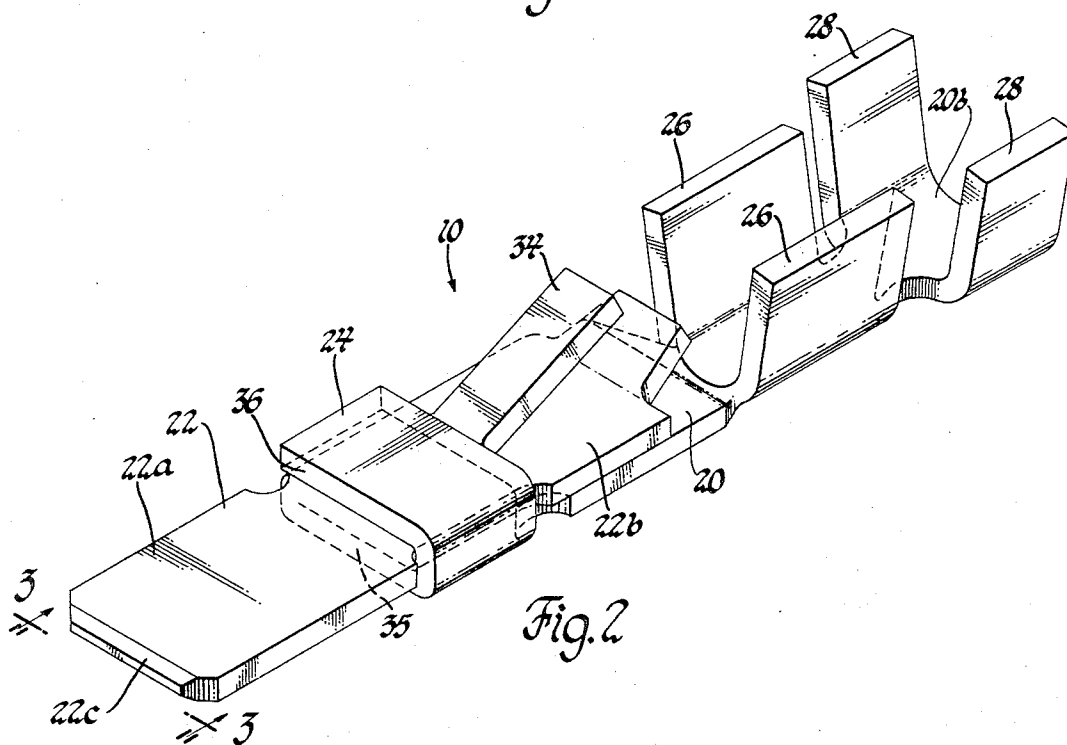


Fig. 2

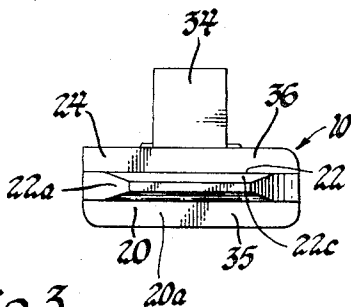


Fig. 3

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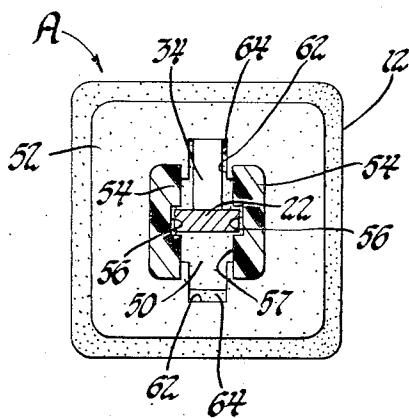
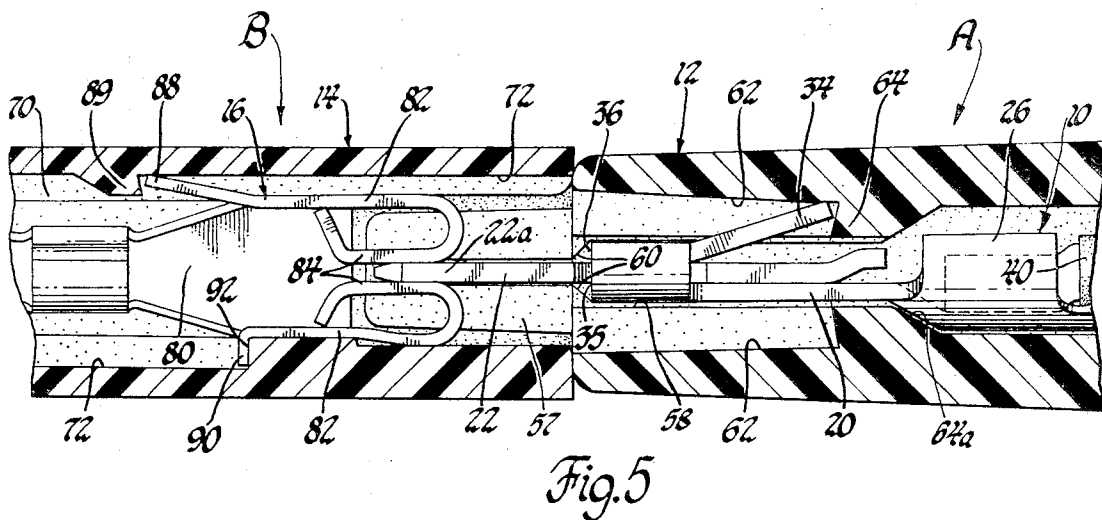
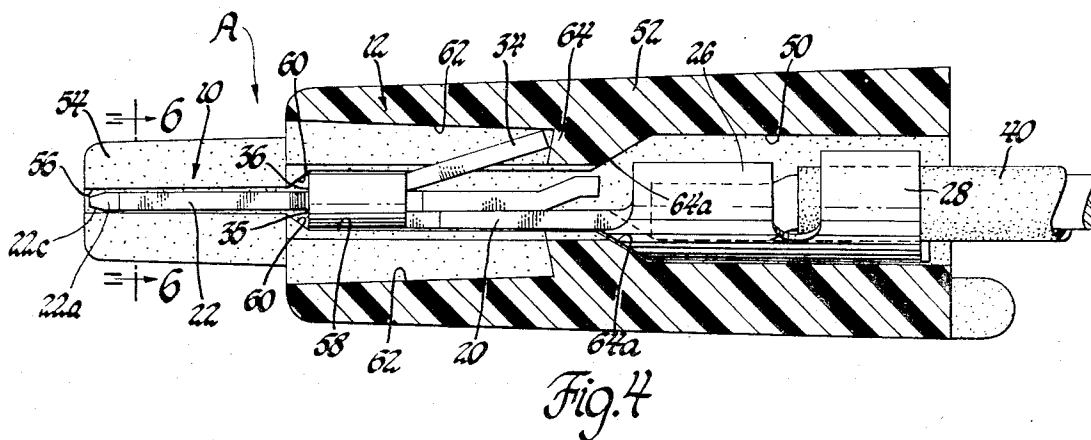
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MALE CONNECTOR TERMINAL AND INSULATOR

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2 Sheets-Sheet 2



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MALE CONNECTOR TERMINAL AND INSULATOR

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4 Claims

ABSTRACT OF THE DISCLOSURE

In a preferred form, this disclosure relates to an electrical connector means comprising a male spade terminal and associated insulator body. The spade terminal is a one-piece metal member of relatively thin gauge stock and has a main body portion, a terminal portion, and a wing portion, the latter two portions being integral with the main body portion along its sides. The terminal portion is adapted to be folded over and across the main body portion and the wing portion is adapted to be folded over and across the terminal portion whereby the terminal portion is disposed between the other two portions. The body and wing portions at their forward ends define stop surfaces and the wing portion has a locking tang extending transversely thereto. The insulator body has a central through opening, a pair of guide channels of a given depth adjacent its forward end and a pair of guide channels of a larger depth adjacent its rearward end. The insulator body also has a first pair of abutment surfaces at the juncture of the different depth guide channels and a second pair of abutment surfaces spaced rearwardly from the first pair of abutment surfaces and extending inwardly into the opening. The spade terminal when inserted into the insulator body is guided and held against rotation by the guide channels and is held against longitudinal movement relative thereto as a result of the stop surfaces on the terminal being engageable with the first pair of abutment surfaces and the locking tang being engageable with one of the second pair of abutment surfaces.

The present invention relates to electrical connector means, and more particularly to an electrical connector means comprising a male spade terminal and insulator body therefor.

Heretofore, flat male terminals, commonly referred to as male spade terminals, have been provided along with associated insulator bodies for housing the same. These terminals have also been provided with transversely extending deflectable locking tangs and/or stop portions which are engageable with abutment surfaces in the insulator body to lock the same in place in the insulator body. However, in order to prevent undue deflection or bending of the male spade terminals when inserted in their associated insulator bodies or upon engaging their mating female terminals, it has usually been necessary to form these male spade terminals from relatively thick metal gauge stock and/or to employ relatively wide terminals. This has inhibited miniaturizing such terminals and has inhibited the making of these terminals from relatively thin metal gauge stock.

Accordingly, an important object of the present invention is to provide a new and improved spade terminal which can be made from relatively thin gauge metal stock and is of a low profile and small width, but yet provide a substantially rigid terminal which resists bending or flexing movement.

Another object of the present invention is to provide a new and improved male spade terminal which comprises a one-piece metal member of relatively thin gauge stock

and which includes a body portion, a terminal portion which is adapted to be folded into juxtaposition with the body portion and a wing portion which is adapted to be folded into juxtaposition with the terminal portion to provide a double folded construction intermediate the ends of the terminal so that the rigidity of the terminal is increased whereby the terminal can be made from relatively thin metal gauge stock, have a relatively narrow width and yet be substantially as strong as a male spade terminal made from heavier gauge metal stock without the double folded construction.

A further object of the present invention is to provide a new and improved spade terminal for use with an insulator body having a central through opening there-through, a pair of oppositely located guide channels adjacent its forward end of a given depth and a pair of oppositely disposed guide channels along its rearward end of a greater depth and which is provided with a first pair of spaced abutments at the juncture of the two pairs of guide channels and a second pair of spaced abutments located rearwardly and extending into other guide channels adjacent the rearward end of the insulator body, and wherein the male spade terminal is a one-piece metal member having a main body portion, a terminal portion which is foldable across and into juxtaposition with the main body portion and a wing portion which is foldable across and into juxtaposition with the terminal portion whereby the terminal portion is disposed between the body and wing portion, and wherein the body and wing portions at their forward end define stop surfaces and wherein the wing portion has a transversely extending deflectable locking tang, the stop surfaces being engageable with the first pair of spaced abutment surfaces and the locking tang being deflectable and positionable behind one of the second pair of abutment surfaces in the insulator body when the terminal is inserted therein to lock the same in place within the insulator body.

An additional object of the present invention is to provide a new and improved male spade terminal and associated insulator body therefor wherein the male spade terminal and the insulator body are of a construction and arrangement such that the insulator body securely holds the spade terminal against rotational and longitudinal movement relative thereto, and wherein the spade terminal can be inserted into the insulator body either right side up or upside down.

The present invention further resides in various novel constructions and arrangement of parts, and further objects, novel characteristics and advantages of the present invention will be apparent to those skilled in the art to which it relates and from the following detailed description of the preferred embodiment thereof made with reference to the accompanying drawings forming a part of this specification, and in which similar reference numerals or characters are employed to designate corresponding parts throughout the several views, and in which:

FIG. 1 is a top plan view of the preferred embodiment of the male spade terminal of the electrical connector means of the present invention and showing the same in blank form prior to being folded;

FIG. 2 is the perspective view of the male spade terminal shown in 1 after it has been folded;

FIG. 3 is an end view of the male spade terminal shown in FIG. 2 and looking in the direction of the arrows 3—3 of FIG. 2;

FIG. 4 is a side elevational view, with portions shown in section, of the preferred embodiment of the electrical connector means of the present invention;

FIG. 5 is a view like that shown in FIG. 4 and showing the electrical connector means connected to a mating female electrical connector means; and

FIG. 6 is a cross sectional view taken along lines 6—6 of FIG. 4.

The present invention provides a novel electrical connector means, and more particularly provides a novel male spade terminal and an insulator body therefor.

As representing a preferred embodiment of the present invention, FIG. 4 shows an electrical connector means, A. The electrical connector means A comprises a male spade terminal 10 positioned within a male insulator body 12. The electrical connector means A is adapted to be inserted within and connected to a female electrical connector means B, which comprises an insulator body 14 containing an associated female terminal 16. When the male insulator body 12 is inserted within the female insulator body 14 and connected thereto the male terminal 10 engages its mating female terminal 16 to provide a conductive path between the two terminals.

The male spade terminal 10 comprises a one-piece metal member made from relatively thin metal gauge stock, preferably two one hundredths ($\frac{2}{100}$) of an inch or less. The male spade terminal 10 generally comprises a main body portion 20, a terminal portion 22 and a wing portion 24.

The main body portion 20 has a forward section 20a and a rearward section 20b. The forward section 20a is substantially flat or planar and the rearward section 20b includes pairs of spaced crimping flanges 26 and 28 which are adapted to be crimped on the bare wire portion and insulating portion of an insulated wire conductor, respectively.

The terminal portion 22 is substantially flat or planar and has a forward section 22a which extends forwardly of the forward section 20a of the main body portion 20 and a rearward section 22b which is integral with the forward section 20a of the main body portion 20 along its side, as indicated by the phantom line 30. The wing portion 24 is integral with the forward section 20a of the main body portion 20 along its opposite side as indicated by phantom line 32. The wing portion 24 also has a rearwardly extending flexible or resilient locking tang 34.

The male spade terminal 10 is adapted to be stamped out of flat, relatively thin, metal gauge stock in the shape of the blank shown in FIG. 1 by a suitable punch and die apparatus, and in a manner conventional in the art. Thereafter, the terminal portion 22 is folded along the side 30 across and into juxtaposition with the forward section 20a of the main body portion 20 and then the wing portion 24 is folded along the side 32 across and into juxtaposition with the rearward section 22b of the terminal portion 22, as shown in FIG. 2. The locking tang 34 is bent so as to extend transversely of the plane of the terminal portion 22, as shown in FIG. 2. The crimping flanges 26 and 28 are adapted to be folded or bent so as to form cradle members for reception of the bare wire portion and the insulator portion of a wire conductor.

By folding over the terminal portion 22 onto the main body portion 20 and the wing portion over the terminal portion 22 a double folded construction across the rearward section 22b of the terminal portion 22 is provided. It should be apparent that by having the rearward section 22b of the terminal portion 22 disposed or sandwiched between the main body portion 20 and wing portion 24 a sturdy, substantially rigid male spade terminal is provided. It should also be apparent that the employment of this double folded construction allows the use of thinner metal gauge stock material than heretofore usually used for forming male spade terminals as well as enabling the terminals to be of a smaller width, since the double folded construction minimizes flexing or bending movements of the terminal portion 22 of the male spade terminal 10. As shown in FIG. 2, the wing portion 24 and body portion 20 at their forwardmost ends provide transversely extending stop surfaces 35 and 36 for preventing over insertion of the male spade terminal

10 into its associated insulator body 12, and in a manner to be hereinafter more fully described.

As best shown in FIG. 4, the male spade terminal 10, after being connected to a wire conductor 40 by crimping the flanges 26 and 28 on the bare metal portion and the insulator portion of a wire conductor 40, is adapted to be inserted and locked in place within its associated insulator body 12. The insulator body 12 comprises a one-piece member made from a suitable insulating material, such as plastic, and has a central, through opening 50 therethrough. The insulator body 12, in the illustrated embodiment, is generally rectangular in cross-section and comprises a main body portion 52 and a pair of spaced forwardly extending portions 54 at opposite lateral sides of the opening 50. The forward body portions 54 each have a longitudinally extending recess or channel 56 in its side wall which communicate with the central opening 50. The recesses 56 define guide channels for slidably receiving and guiding the forward section 22a of the terminal portion 22 when the male spade terminal 10 is inserted through the opening 50. The spaced forward portions 54 define a longitudinally extending slot 57 for receiving portions of the female terminal 16, as will be hereinafter more fully described. The recesses 56 are aligned with recesses or channels 58 in the opposite side walls of the main body portion 52. The recesses 58 have a larger width and depth than the recesses 56 and slidably receive and guide the double folded construction of the male spade terminal 10 intermediate its ends. At the juncture of the recesses 56 and 58 are forwardly tapered, transversely extending abutment surfaces 60 which are adapted to be engaged by the stop surfaces 35 and 36 of the male spade terminal 10 to prevent over insertion of the latter into the opening 50 of the insulator body 12.

The main body portion 52 of the insulator body 12 also has a second pair of recesses 62 formed in opposite side walls thereof and which are spaced 90° from the recesses 58. The recesses 62 extend the full length of the main body portion 52. Projecting inwardly from the bottom of each of the recesses 62 intermediate the ends of the body portion 52 is an abutment 64 having a tapered entry ramp or end 64a. The abutments 64 are in vertical alignment, as viewed in FIG. 4.

The male spade terminal 10 is connected to its associated insulator body 12 by inserting the same through the opening 50 from right to left, as viewed in FIG. 4. As the male spade terminal 10 is inserted into the opening 50 the locking tang 34 will be disposed within one of the recesses 62 (the upper recess 62 if inserted right side up, as viewed in FIG. 4) and the opposite sides of the double folded construction intermediate the ends of the male spade terminal 10 will be guided within the recesses 58. As the male spade terminal 10 is further inserted within the opening 50 the flexible locking tang 34 will engage the tapered ramp 64a of the abutment 64 and be deflected inwardly toward the terminal portion 22 in opposition to its self-biasing forces tending to return it toward its normal position. At the same time the forward section 22a of the terminal portion 22 will be slidably received within the recesses 56 and be guided thereby. The tapered abutment surfaces 60 serve to guide the forward end 22a of the terminal portion 22 into the recesses 56 should the terminal portion engage the abutment surface 60 when inserted into the insulator body 12. The guiding of the terminal portion 22 into the recesses 56 is further facilitated by tapering the forwardmost end 22c of the terminal portion. When the male terminal 10 is fully inserted within the opening 50 stop surfaces 35 and 36 will engage the abutment surfaces 60 and the locking tang 34 will be disposed ahead of the abutment 64 and return toward its normal position due to its self-biasing forces and be located behind the abutment 64. The engagement between the stop surfaces 35 and 36 and the abutment surfaces 60 prevent forward longitudinal movement of the male spade terminal 10 relative to

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the connector body 12 and the engagement between the locking tang 34 and the abutment 64 prevent rearward longitudinal movement of the male connector terminal relative to the insulator body 12.

It should be noted that by providing two oppositely disposed recesses 62 and two abutments 64 the male spade terminal 10 can be inserted within the opening 50 either right side up or upside down, that is, at two different orientations 180° apart.

The male electrical connector means A is adapted to be connected to the mating female electrical connector means B by inserting the forward end portions 54 of the body 12 into the body 14 from right to left, as viewed in FIG. 5. The body 14 of the mating female electrical connector means B is made from a suitable electrically insulating material, such as plastic, and is provided with a central opening 70 therethrough. The body portion at its forward end has a pair of recesses or guide channels 72 in opposite side walls thereof and which are in communication with the central opening 70. The central opening 70 at the forward end of the body 14 is shaped so as to slidably receive the forward portions 54 of the insulator body 12. The insulator bodies 12 and 14 are held connected together by resilient spring fingers (not shown) carried by the body 14 and which are receivable within detents or recesses (not shown) on the body 12, and in a manner well known to those skilled in the art.

The mating female terminal 16 does not per se form any part of the present invention and will only be described to the extent necessary for complete understanding of the present invention. The mating female connector 16 has a main body portion 80 and transversely extending side portions 82 at its opposite sides. The side portions 82 adjacent their forward ends are reversely bent to define resilient spring fingers 84. The spring fingers 84 inherently are adapted to resiliently engage the forward section 22a of the terminal portion 22 of the male spade terminal 10 the latter is inserted therebetween. The resilient spring fingers 84 engage the terminal portion 22a with a spring pressure to insure good electrical contact therewith. The slot 57 in the forward end portions 54 of the body 12 freely receive the forward end portions of the spring fingers 84 when the male spade terminal 10 is connected to the female terminal 16.

The female terminal 16 is held against rearward movement relative to the insulator body 14 by a locking tang 88 which cooperates with an abutment 89, and in the same manner as the locking tang 34 cooperates with the abutment 64 in the insulator body 12. The female terminal 16 is held against forward movement relative to the insulator body 14 by a bent flange 90 which engages an abutment surface 92 in the insulator body portion 14.

From the foregoing, it should be apparent that a novel male spade terminal 10 and associated insulator body 12 therefor has been provided. It should be further apparent that the male spade terminal 10 has a low profile, can be of a relatively small width, made from a relatively thin gauge stock and yet is of a sturdy and substantially rigid construction. The double folded construction for the male spade terminal alone, or in conjunction with the guide channels 56, provides for a sturdy male electrical connector means in which bending or flexing movement of the thin spade terminal portion is prevented or substantially minimized.

Although the illustrated embodiment thereof has been described in great detail, it should be apparent that certain modifications, changes, and adaptations may be made in the illustrated embodiment, and that it is intended to cover all such modifications, changes and adaptations which come within the spirit of the present invention.

What is claimed is:

1. An electrical terminal which is adapted to be connected to a wire conductor comprising: a one-piece metal member of relatively thin gauge metal stock and which

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has a main body portion, a terminal portion and a wing portion; said main body portion having a substantially flat forward section and a rearward section provided with a crimping flange which is adapted to be crimped onto a wire conductor, said terminal portion being substantially flat and having a rearward section integral with one side of the forward section of said main body portion and a forward section extending forwardly of said forward section of said main body portion, said terminal portion being folded along said side across and in juxtaposition with said forward section of said main body portion, said wing portion being integral with one of said main body and terminal portions along its opposite side, said wing portion being folded along said opposite side across and in juxtaposition with said rearward section of said terminal portion so that said terminal portion is disposed between said main body portion and said wing portion whereby said terminal portion is of a relatively rigid construction even though it is of a relatively thin gauge metal stock.

2. An electrical terminal as defined in claim 1 wherein said wing portion is integral with said main body portion along its side opposite the side to which the terminal portion is integral with the main body portion.

3. An electrical terminal which is adapted to be connected to a wire conductor and which is adapted to be received within an insulator body having a central through opening, a pair of guide channels communicating with the opening and spaced abutment surfaces extending transversely of said guide channels comprising: a one-piece metal member of relatively thin gauge stock and which has a main body portion, a terminal portion and a wing portion, said main body portion having a substantially flat forward section and a rearward section provided with a crimping flange which is adapted to be crimped on the wire conductor, said terminal portion being substantially flat and having a rearward section integral with a side of the forward section of said main body portion and a forward section extending forwardly of the forward section of said main body portion, said terminal portion being folded along said side across and in juxtaposition with said forward section of said main body portion, said wing portion being integral with the forward section of said main body portion along the opposite side of the latter, said wing portion being folded along said side across and in juxtaposition with said rearward section of said terminal portion so that said terminal portion is disposed between said main body portion and said wing portion whereby said terminal portion is of a relatively rigid construction, said terminal being adapted to be inserted in said insulator body and with the opposite sides of said forward section of said terminal portion being received within said guide channels and said body portion and said wing portion at their ends adjacent the forward section of said terminal portion providing stop surfaces which are engageable with the spaced abutment surfaces to prevent over-insertion of the terminal within the insulator body.

4. In combination, an electrical male spade terminal and insulator body therefor comprising: a one-piece insulator body made from an electrically insulating material and having a central through opening therethrough, said insulator body adjacent its forward end having first recesses at opposite side portions which define guide channels, said insulator body having second recesses adjacent its rearward end which are aligned with first recesses but of a larger transverse dimension, said body at the juncture of said aligned recesses having transversely extending abutment surfaces and the body having a second pair of abutment surfaces rearwardly spaced from the first pair of abutment surfaces, said spade terminal comprising a one-piece metal member which has a main body portion, a terminal portion and a wing portion, said main body portion having a substantially flat forward section and a rearward section provided with a crimping flange which is adapted to be crimped on a wire conductor, said termi-

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nal portion being substantially flat and having a forward section extending forwardly of said forward section of said main body portion and a rearward section integral with a side of the forward section of said main body portion, said terminal portion being folded along said side across and into juxtaposition with said forward section of said main body portion, said wing portion being integral with the forward section of said main body portion along its opposite side and being folded along said side across and into juxtaposition with said rearward section of said terminal portion so that said terminal portion is disposed between said main body portion and said wing portion whereby said terminal is of a relatively rigid construction, said wing portion including a locking tang extending transversely thereof and said wing portion and said body portion at their forwardmost ends defining transverse stop surfaces, said male spade terminal when inserted in said insulator body having said forward sec-

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tion of said terminal portion being slidably received within said first recesses for guiding the same and said locking tang engaging one of the second pair of abutment surfaces and being deflectable inwardly as it passes over the abutment, said stop surfaces being engageable with said first pair of abutment surfaces and said locking tang flexing outwardly behind said one abutment to securely lock the terminal in place within the insulator body.

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