

May 28, 1968

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3,386,074

ELECTRICAL CONNECTOR

Filed April 28, 1954

3 Sheets-Sheet 1

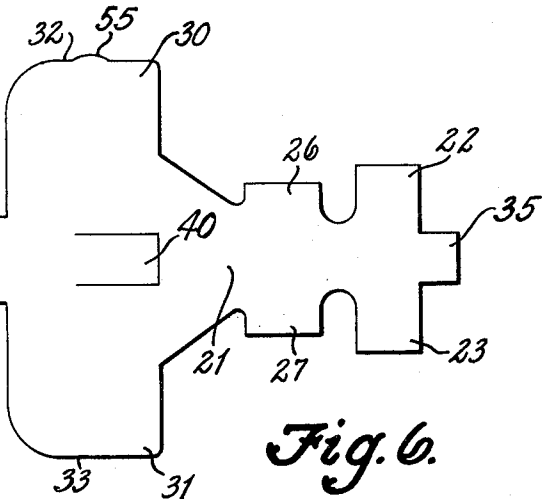


Fig. 6.

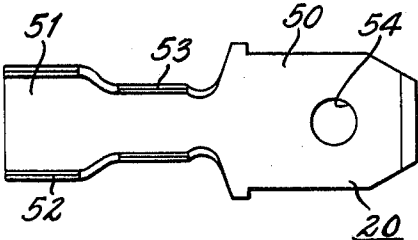


Fig. 4.

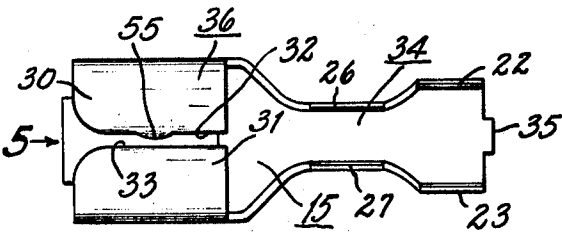


Fig. 3.

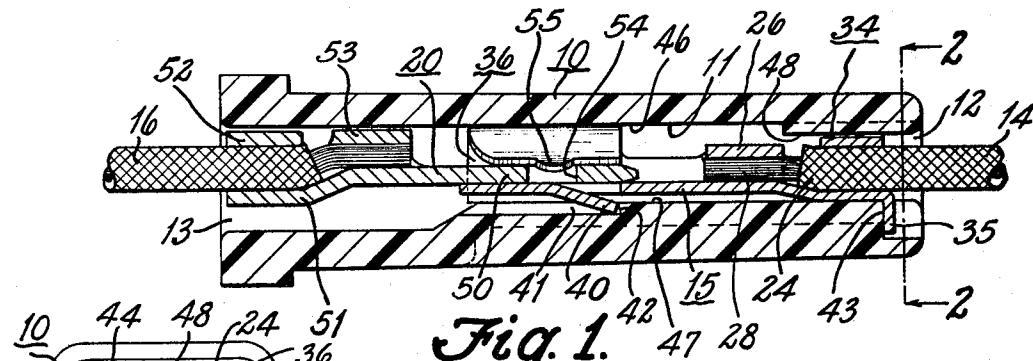


Fig. 1.

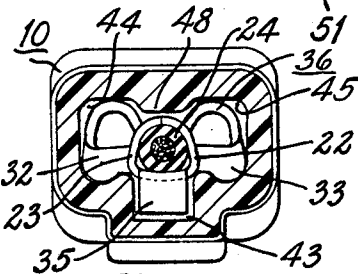


Fig. 2.

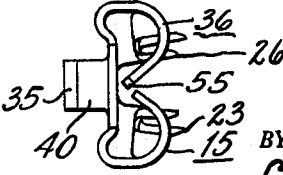


Fig. 5.

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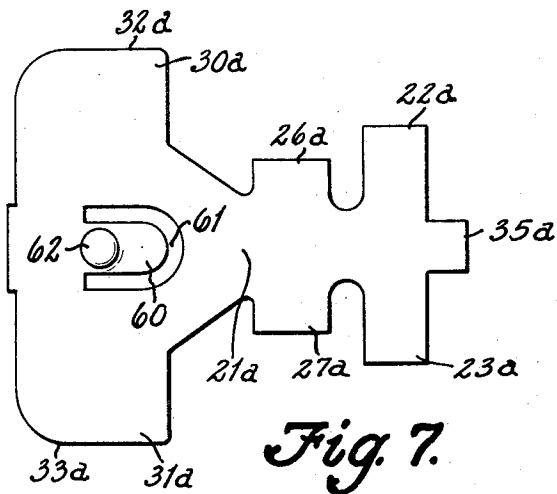


Fig. 7.

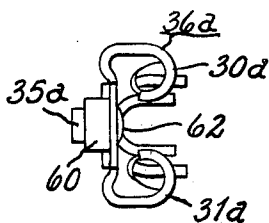


Fig. 9.

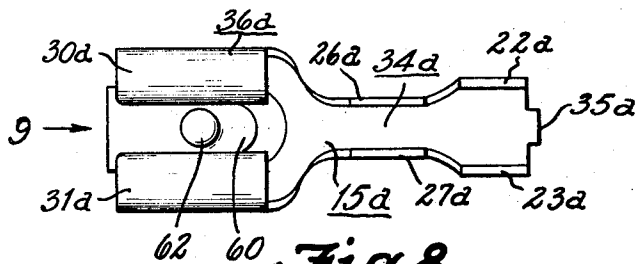


Fig. 8.

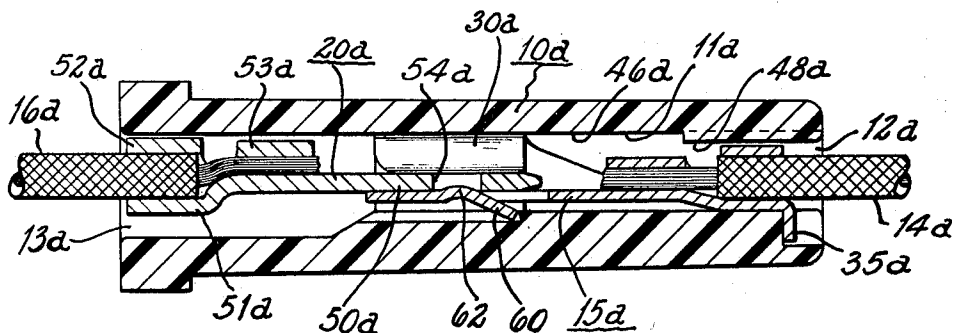


Fig. 10.

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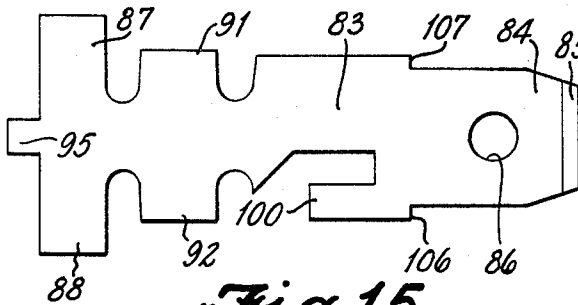


Fig. 15.

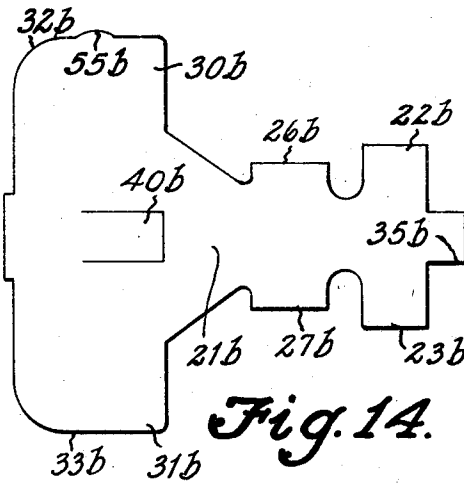


Fig. 14.

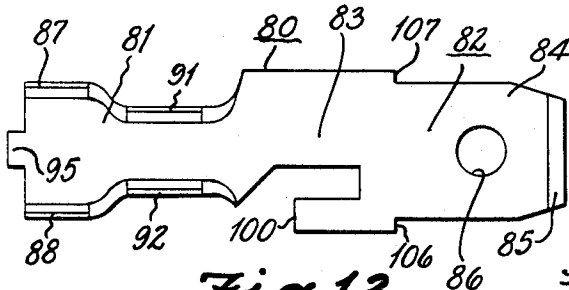


Fig. 13.

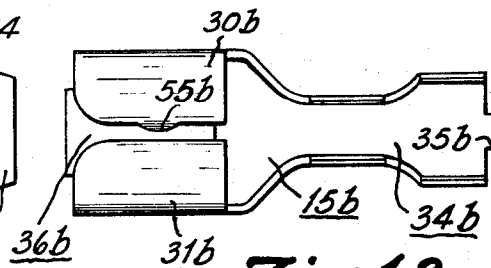


Fig. 12.

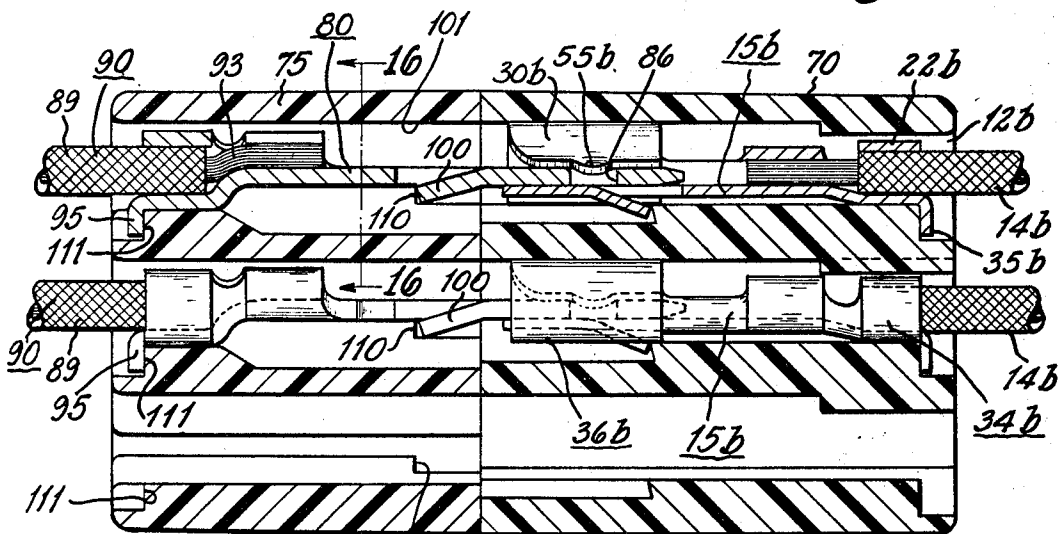


Fig. 11.

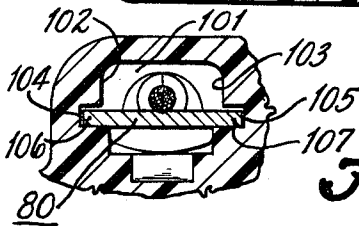


Fig. 16.

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3,386,074

ELECTRICAL CONNECTOR

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9 Claims. (Cl. 339—258)

This invention relates to electrical connectors adapted for providing connection or disconnection between one or more electric circuits. More particularly the invention concerns an electrical connector providing for connecting together the ends of wires in making electric circuit to electrically operated devices.

An object of the invention is to provide a simplified form of electrical connector that will satisfactorily effect connection between the ends of wires for electric circuits.

Another object of the invention is to provide an electrical connector in which the terminal portion of the connector is locked within an electrical insulating body.

A further object of the invention is to provide an electrical connector that can be produced at lower manufacturing cost and with a minimum quantity of material with a minimum waste of stock being effected.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the invention is clearly shown.

In the drawings:

FIGURE 1 is a longitudinal cross sectional view through an electrical connector constructed in accordance with this invention.

FIGURE 2 is a cross sectional view taken along line 2—2 of FIGURE 1.

FIGURE 3 is a plan view of the female terminal used in the connector shown in FIGURE 1.

FIGURE 4 is a plan view of the male terminal used in the connector shown in FIGURE 1.

FIGURE 5 is an end view of the terminal shown in FIGURE 3 taken in the direction of the arrow 5.

FIGURE 6 is a plan view of a blank from which the terminal of FIGURE 3 is formed.

FIGURE 7 is a plan view of a blank from which the terminal of FIGURE 8 is formed.

FIGURE 8 is a plan view of a female terminal of slightly modified form shown in FIGURE 3.

FIGURE 9 is an end view of the terminal of FIGURE 8 taken in the direction of the arrow 9 on FIGURE 8.

FIGURE 10 is a longitudinal cross sectional view of an electrical connector incorporating the terminal shown in FIGURE 8.

FIGURE 11 is a longitudinal cross sectional view of a multiple electrical connector block in which both female and male terminals are mounted in separate insulating blocks.

FIGURE 12 is a plan view of a female connector used in the terminal block shown in FIGURE 11.

FIGURE 13 is a plan view of a male terminal used in the connector block shown in FIGURE 11.

FIGURE 14 is a plan view of a blank from which the terminal of FIGURE 12 is formed.

FIGURE 15 is a plan view of a blank from which the terminal of FIGURE 13 is formed.

FIGURE 16 is a transverse cross sectional view taken along line 16—16 of FIGURE 11.

The electrical connector shown in FIGURE 1 is a simplification of the electrical connector disclosed and described in the copending application of Elbert L. John-

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son, Ser. No. 186,023, filed Sept. 21, 1950, now patent 2,682,038. The connector of this invention is constructed in a manner to substantially reduce cost and use less material in the manufacture of the terminal members.

In this invention the electrical connector consists of a body 10 made of electrical insulating material. The body 10 has a through passage 11 that extends longitudinally of the body. A female terminal member 15 is adapted to be inserted into the passage 11 through the end 12. This terminal member is locked within the passage 11 in a manner hereinafter described. A male terminal member 20 is adapted to be inserted in the passage through the end 13 thereof and engage the female terminal 15 to provide electrical connection between the wire 14 carried by the terminal member 15 and the wire 16 carried by the terminal member 20. The terminal member 15 is formed from a flat sheet metal blank shown in FIGURE 6. This terminal blank comprises a base portion 21 that extends longitudinally of the blank. A first pair of side flanges 22 and 23 extend from opposite sides of the base portion 21 and are adapted to be formed into a circular shape, as illustrated in FIGURE 2 to encircle the insulating sheathing 24 of the wire 14, as shown in FIGURES 1 and 2. A second pair of side flanges 26 and 27 extend from opposite sides of the base 21 and are adapted to encircle the conduit wire 28 of the wire 14 to make electric conductive contact between the terminal 15 and the bare end 28 of the wire 14, as shown in FIGURE 1.

The base 21 of the blank shown in FIGURE 6 has a pair of side wings 30 and 31 extending from opposite sides thereof. These side wings 30 and 31 are reversely bent upon themselves extending first downwardly and then upwardly to form a raised flat floor or base portion therebetween, as shown in FIGURE 5, to place their longitudinal edges 32 and 33 respectively in close proximity to the base 21 so that the male spade terminal 20 can be received between the wing edges 32 and 33 and the base 21, shown in FIGURE 1, whereby to make electric conductive contact. The integral continuity of the reversely bent portions and the connecting raised floor portion extends the elastic system of said members so that a mating spade terminal is resiliently and frictionally operatively held.

The terminal member 15 thus includes a wire receiving wire portion 34 that includes the side flanges 22, 23, 26, 27 and the base portion therebetween and a terminal portion 36 that includes the wings 30 and 31 and the base portion therebetween.

A tang 35 extends longitudinally from the wire receiving portion 34 of the terminal member 15. This tang is bent angular relative to the base portion 21, as shown in FIGURE 1 and provides a stop to position the terminal member 15 within the connector body 10.

A resilient prong 40 is formed downwardly from the base portion 21 and projects from the base on the same side as the tang 35. The prong 40 and the tang 35 cooperate with the connector body 10 to longitudinally position the terminal member 15 within the passage 11 in the connector body 10, as shown in FIGURE 1.

The connector body 10 has a recess 41 that forms a shoulder 42 in one wall thereof. Thus, when the terminal member 15 is inserted into the passage 11 through the end 12 of that passage, the resilient prong 40 will snap into the recess 41 and engage the shoulder 42. The tang 35 will engage the recessed end wall 43 in the connector body 10. Thus, the prong 40 and the tang 35 lock the terminal member 15 within the passage 11 in the connector body.

The passage 11 in the connector body 10 has the channel areas 44 and 45 that receive the formed wings 32 and

33, as shown in FIGURE 2. These formed wings engage the wall 46 of the passage 11 with the prong 40 engaging the shoulder 42 in the opposite wall 47 of the passage 11. Thus the terminal portion 36 of the terminal member 15 is prevented from transverse movement relative to the passage 11 in the body 10 whereby to retain the prong 40 in engagement with the shoulder 42 after the terminal 15 is inserted in the passage 11.

The connector body 10 also has an inwardly directed projection 48 that is in close proximity to the wire receiving portion 34 of the terminal connector 15 so that the wire receiving portion 34 cannot move transversely relative to the passage 11 whereby the tang 35 is prevented from entry into the passage 11.

The connector body 10 has sufficient length to receive the spade male terminal 20, enclosing the full terminal to prevent shorting between the terminal and some grounded part. The spade terminal 20 in FIGURE 4 comprises a flat spade member 50 that forms the terminal portion of the member. The wire receiving portion 51 having the flange portions 52 and 53 for retaining the wire 16 in the wire receiving portion 51 in the same manner as the wire 14 is retained in the wire receiving portion 34 of the terminal member 15.

The spade terminal portion 50 has an opening 54 that is adapted to be engaged by a projecting detent 55 provided on the edge 32 of the wing 30 of the terminal member 15 whereby to frictionally retain the spade terminal 50 between the wings 30 and 31 and the base portion 21 of the terminal member 15 as shown in FIGURE 1.

In FIGURES 7-10 inclusive there is shown an electrical connector quite similar to that shown in FIGURE 1 with the exception that the female terminal member 15a is slightly modified from the member 15 shown in FIGURE 1. Those elements of the device shown in FIGURES 7-10 that are the same as those shown in FIGURES 1-6 inclusive carry the same reference numeral but with the suffix "a."

The terminal member 15a, shown in FIGURE 8, is formed from the blank shown in FIGURE 7. This blank is the same as that shown in FIGURE 6 with the exception that the resilient prong 60 is spaced from the base portion 21a by a channel 61. A raised detent 62 is formed on the resilient prong 60 and is adapted to engage the opening 54a of the terminal member 20a in the same manner that the detent 55 engages the opening 54 of the terminal member 20. Other than for the modification just referred to concerning the prong 60 and the detent 62, the construction of the device shown in FIGURES 7-10 inclusive is identical with the device shown in FIGURES 1-6 inclusive.

In FIGURE 11 there is shown an electrical connector for making multiple electrical connections wherein the female terminals are carried in a connector body 70 and the male electrical terminals are carried in a connector body 75. The female terminals carried in the connector body 70 are identical with the terminal connector 15 heretofore disclosed and described with reference to FIGURES 1-6 and are retained in the connector body in the several passages thereof in the same manner heretofore disclosed and described with reference to the device of FIGURE 1. Hence the elements of the connector body 70 that are identical with the elements of the connector 15 and the body portion for this connector shown in FIGURE 1 are identified by the same reference numerals but with the suffix "b."

The male terminal members 80 carried within the connector body 75 are shown in FIGURE 13 and are formed from a blank shown in FIGURE 15. The terminal member 80 comprises a wire receiving portion 81 and a terminal portion 82 that are disposed at opposite ends of the base portion 83 of the terminal 80. The terminal portion 82 of the terminal 80 comprises a flat spade terminal 84 having a tapered edge 85. An opening 86 is placed in the spade terminal portion 84 for engagement by the

detent 55b of the female member 15b, as shown in FIGURE 11. The wire receiving portion 81 of the terminal 80 includes the first side flanges 87 and 88 that are adapted to encircle the insulating sheathing 89 of a wire 90. A second pair of side flanges 91 and 92 engage the conduit wire 93 to make electrical connection therewith, as shown in FIGURE 11. A tang 95 is formed downwardly from the base portion 83, as shown in FIGURE 11 and is adapted to provide a stop to position the terminal member 80 within the connector 75, as shown in FIGURE 11. A resilient prong 100 is formed downwardly from the base portion 83 on the same side as the tang 95 and is adapted to cooperate with the tang to lock the terminal 80 against longitudinal movement in the connector body 75.

The connector body 75 has a through passage 101 to receive the terminal member 80. The side walls 102 and 103 of the passage 101 have the longitudinally extending grooves 104 and 105 that receive the longitudinally extending projections 106 and 107 respectively. The projections 106 and 107 prevent transverse movement of the terminal portion 82 of the terminal 80 whereby to maintain the resilient prong 100 in engagement with the shoulder 110 provided in the bottom wall of the passage 101.

When the terminal 80 is inserted into the passage 101 the tang 95 engages the recessed wall 111 in the connector body 75 so that the tang 95 and the prong 100 cooperate in their engagement with the connector body 75 to prevent longitudinal movement of the terminal 80 in the passage 101 and lock the same therein.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In an electrical connector, a terminal clip including opposed side wall portions, an integral web connecting said side wall portions, a major transversely centrally located portion of said web being flat for defining a contact surface for the clip, and inwardly directed flanges extending from said side wall portions and overhanging said web, the side portions of said web between the flat central portion and said side wall portions extending downwardly and joining said side wall portions below, relative to said flanges, the plane of said flat central portion.

2. A sheet metal electrical connector comprising a wire gripping portion and a terminal clip, said clip including a web having a contact surface thereon, opposed overhanging spring members extending from the longitudinal sides of said web and having terminal edges overlying and spaced from said contact surface to engage yieldingly therewith a contact blade, the longitudinal side portions of said web being concavely bowed so as to extend, from the web portion including said contact surface, first downwardly and then upwardly in integral continuity with said spring members respectively.

3. A terminal clip for electrical connection with a substantially flat contact blade comprising a web having a contact surface thereon, overhanging spring members extending from opposed sides of said web, the ends of said members overlying and being spaced less than the thickness of the blade from said contact surface for yieldingly pressing the blade against said contact surface, the longitudinal side portions of said web being bowed to extend from the web portion including said contact surface, first downwardly and outwardly and then around the side edges of the blade in integral continuity with the respective spring members for extending the elastic system of said members to include a portion of said web underlying the blade.

4. A contact terminal member comprising a one piece member of sheet metal, said member comprising a flat base having a terminal portion at one end thereof and a

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trough shaped wire receiving portion at the opposite end thereof having a first pair of side flanges adapted to encircle an insulated portion of a conductor and a second pair of side flanges adapted to encircle the conductor wire of the conductor, said side flanges extending upwardly from the same side of said base, said base including a tang at the end thereof at one edge of said first flanges and formed angular to the base and projecting from the side thereof opposite to that of said flanges, and a resilient prong struck downwardly of the base between said terminal portion and said second flanges and projecting from the same side of the base as said tang and spaced therefrom and directed angularly toward said tang, said prong being offset laterally from longitudinal alignment with said tang, said tang and said prong providing means for locking of the terminal in a specified position on a support.

5. A contact terminal member comprising a one piece member of sheet metal, said member comprising a flat base having a terminal portion at one end thereof and a wire receiving portion at the opposite end thereof having a first pair of side flanges adapted to encircle an insulated portion of a conductor and a second pair of side flanges adapted to encircle the conductor wire of the conductor, said side flanges extending upwardly from the same side of said base, said base including a tang at the end thereof at one edge of said first flanges and formed angular to the base and projecting from the side thereof opposite to that of said flanges, said terminal portion comprising a flat spade terminal and including a resilient prong extending longitudinally of the terminal and struck downwardly of the base between said terminal portion and said second flanges and laterally offset relative to said tang from longitudinal alignment therewith and projecting toward said tang from the same side of the base as said tang and longitudinally spaced therefrom and directed angularly outward relative to said spade terminal, said tang and said prong providing cooperating means for locking of the terminal in a support.

6. A contact terminal member comprising a one piece member of sheet metal, said member comprising a flat base having a pair of upwardly extending reversely bent wings forming with said base a terminal engaging portion at one end thereof and having a trough shaped wire receiving portion at the opposite end thereof having a first pair of side flanges extending upwardly from said base adapted to encircle an insulated portion of a conductor placed in said trough shaped portion and a second pair of side flanges extending upwardly from said base on the same side as said first pair of flanges and adapted to encircle the conductor wire of the conductor, said side flanges extending upwardly from said base on the same side as said wings, said base including a tang at the end thereof at one edge of said first flanges and formed angular to the base and projecting from the side thereof opposite to that of said wings and flanges and a resilient prong struck downwardly of the base in the portion thereof between said wings and projecting from the same side of the base as said tang and spaced therefrom and directly angularly toward said tang, said tang and said prong providing means for locking of the terminal in a specified position on a support.

7. For an electrical connector to effect connection between ends of wires for electric circuits, a body of insulating material having a passage extending longitudinally therethrough to receive an electrically conducting terminal member therein, solid insulating wall portions forming said body extending from one end to the other thereof and completely surrounding the passage to enclose completely the terminal member therein fully free of electrical shorting thereof to electrical ground potential, an inwardly directed longitudinally extending projection portion formed with one said wall portion at one open end of the passage, a first shoulder formed on said projection within the passage intermediate opposite ends thereof by a first recess in said one wall portion, and a

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second shoulder one said projection formed in the said one wall portion at the opposite end of said projection, said second shoulder having a location opposite an inwardly directed projection portion on a wall portion located opposite to said one wall in a transverse cross section of said body immediately adjacent said one open end of the passage to support a terminal member free of possible transverse movement relative the passage at one end, said one wall portion at a longitudinally intermediate passage location opposite said first recess shoulder cooperating therewith to support a terminal member free of possible transverse movement relative to the longitudinal passage of said body intermediate the ends thereof.

8. A contact terminal member for the electrical connector of claim 7, comprising, a one piece member of sheet metal including a longitudinally extending base portion insertable in the passage of said body of insulating material, a first pair of side flanges extending laterally and upwardly of said base portion at one end thereof and adapted to encircle an insulated portion of a conductor, a second pair of side flanges extending laterally of said base portion adjacent said first flanges and adapted to encircle an uninsulated portion of a conductor to make electric conductive contact therewith, said first flanges extending above said base in close proximity to said inwardly directed projection portion formed with said one wall portion of said insulating body at one open end of the passage therethrough, a terminal portion including side wings with reverse bends projecting upwardly from opposite side edges of said base portion at an end opposite said first flanges, said one piece member of sheet metal being located totally within said body of insulating material, a tang bent from said base portion downwardly thereof adjacent said first flanges, said tang engaging as a longitudinal movement stop in one direction against said second recess shoulder of said body with said first flanges and said inwardly directed projection portion cooperating to prevent movement of said terminal member at this one end transversely of the passage in said body detent locking means cooperable with said side wings of said terminal portion to provide engagement therewith to receive a terminal plug between edges of said wings and said base portion, and a resilient prong projecting downwardly from said base portion with said terminal portion, said prong being bent angularly toward and in longitudinal alignment with said tang and locking behind said first recess shoulder of said body said side wings at the end of said base portion adjacent said detent locking means engaging said one wall portion for one resilient transverse support within said body at a cross section thereof intermediate ends of said body with said prong cooperating with said wings for a second transverse support as well as with said tang to position said contact terminal member fully and securely within said insulating body longitudinally.

9. An electrical connector, comprising, in combination a terminal carrier body of of electrical insulating material having a passage extending longitudinally therethrough, one wall of said passage having a first recess and second recess each forming a shoulder therewith, a one piece terminal member of sheet metal completely surrounded longitudinally by said carrier body, said terminal member including a terminal portion at one end thereof and a wire receiving portion at the opposite end thereof within said passage, a tang bent downwardly from said base at the wire receiving end thereof, a resilient prong bent downwardly from said base at the terminal portion end thereof to permit free insertion of the terminal into said body in one direction and engaging the shoulder formed with the said first recess against removal in the opposite direction, a pair of wings on opposite sides of the terminal portion end of said base, said wings formed reversely bent on themselves to dispose their longitudinal edges on the same side of the base in close proximity thereto to receive a terminal lug between the said edges and said

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base, said terminal portion engaging the wall of said pas-
sage opposite to said first shoulder cooperating with said
prong engaging said shoulder for a first support at the
terminal end portion of said base securing said terminal
member free of movement transverse to the said passage
at said terminal portion end, and detent locking means
cooperable with said side wings of said terminal portion
against the terminal lug joining with the first support to
assure terminal portion and prong engagement with said
body preventing transverse movement, said wire receiv-
ing portion engaging the wall of said passage opposite said
second recess shoulder at one end of said body providing
a second support securing said terminal member free of
movement transverse to the said passage.

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