

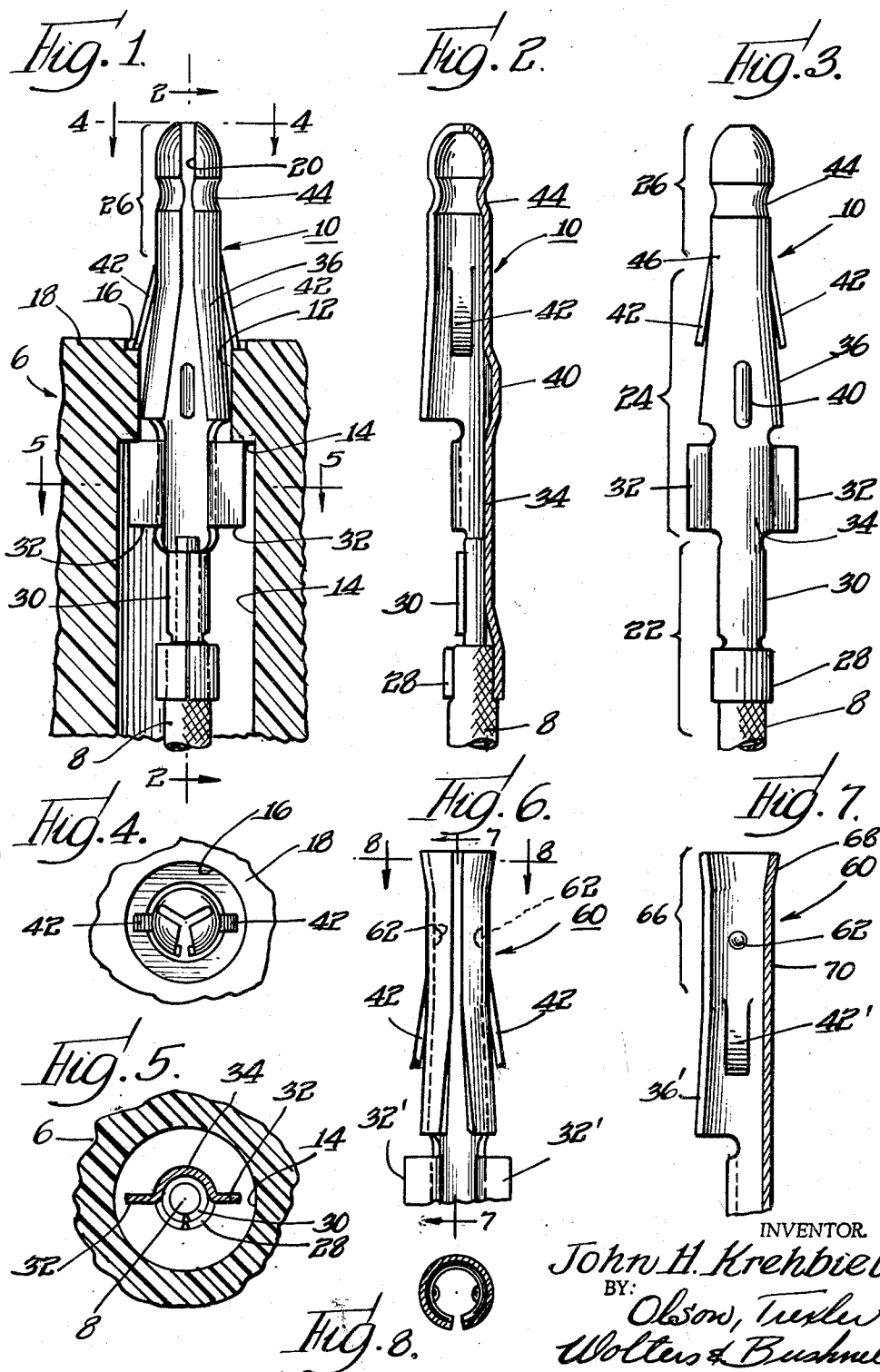
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WIRE CONNECTOR

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3,178,673

WIRE CONNECTOR

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The present invention pertains to connectors for use in the electrical circuits, and it relates particularly to an improved terminal construction.

The contemporary trend toward miniaturization in electrical systems has advanced novel techniques for combining one or more elements, previously arranged separately, into very compact, lightweight units. To obtain further savings in space and mass, the means employed to electrically connect the miniature units have also been greatly reduced in size from that which was common ten or fifteen years ago. Thus, electrical connectors such as plug and receptacle constructions adapted to link 40-60 separate circuits are preferably miniaturized to the highest degree consistent with maintaining insulated separation between the circuits and a reasonable manufacturing cost.

The placement of a multiplicity of terminals in a plug or receptacle has been found to occasion some difficulty with respect to ease of assembly and precision of terminal orientation. It has been found that the arrangement of the terminals in the associated terminal carrying unit must be highly exact if the interconnection between the parts is to be effected with ease and rapidity.

It is an important object of the present invention to provide an improved electrical terminal mountable in a bore of an insulating connector, the terminal being received by said connector in a sliding, centering action thereby to stand erect in an outstanding position with respect to said connector.

Another object is to provide electrical connectors of the foregoing type in which the terminal is resiliently self-supporting in an erect position both radially and longitudinally with respect to an associated connector block.

Still another object is to provide an electrical terminal of the foregoing type which affords a measure of service flexibility by being facily mountable on from an associated insulating unit without the use of hand tools.

A further object of the present invention is to provide an improved electrical terminal for mounting in a snap action with an insulator unit, which terminal may be economically manufactured from sheet metal in interconnected multiples or chains, each terminal incorporating crimpable portions for engagement with an associated wire, the terminals being adapted for arrangement in multiples in associated insulated units.

Further features of the invention pertain to the particular arrangement of the portions of the terminal whereby the above-outlined additional operating features are obtained.

This invention, both as to its organization and method of operation, together with further objects and advantages, will best be understood by reference to the following specification taken in association with the accompanying

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drawing wherein like reference numerals distinguish like parts throughout, in which:

FIGURE 1 is an elevational view of a male terminal made in accordance with and embodying the features of the present invention, an associated insulator plug being shown in section;

FIG. 2 is a longitudinal sectional view of the terminal of FIG. 1, the view being taken generally in the direction of the arrows along the line 2-2 therein;

FIG. 3 is an elevational view similar to FIG. 1 but showing the opposite side of the terminal, the associated insulator being absent from this view;

FIG. 4 is a plan view taken in the direction of the arrows along the line 4-4 of FIG. 1;

FIG. 5 is a lateral sectional view of the terminal of the present invention taken in the direction of the arrows along the line 5-5 in FIG. 1;

FIG. 6 is a fragmentary sectional view of a female terminal embodying the principles of the present invention;

FIG. 7 is a longitudinal sectional view taken generally in the direction of the arrows along the line 7-7 in FIG. 6; and

FIG. 8 is a cross sectional view taken in the direction of the arrows along the line 8-8 of FIG. 6.

There is shown in FIG. 1 of the drawing an insulator block 6, and an insulated wire 8 having connected thereto an electrical terminal 10 which is made in accordance with and embodies the principles of the present invention. The insulator block 6 may be either of plug or receptacle form and may be manufactured from certain ones of the phenolic materials which afford a high degree of electrical isolation.

A central bore 12 in the insulator 6 is sized complementary to the terminal 10 and has at each end a first counterbore 14 and a second counterbore 16 which opens onto the facial surface 18 of the insulator 6. It is to be recognized that the bore 12 is of a smaller diameter than that of either the first or second counterbores, 14 and 16 respectively, the significance of which will appear presently.

Referring particularly to FIGS. 1-3, the connector 10 shown is of male-form arrangement and is of hollow tubular construction, being generally of elongated cylindrical formation. From another aspect, the terminal 10 may be described as a cylinder irregularly shaped and having a longitudinal slit 20 in a wall thereof wherein a longitudinal plane passed through the slit 20 would divide the terminal 10 into complementary halves, as clearly shown in FIG. 2.

The terminal 10 may be separated according to function into three longitudinally extending portions; a wire-engaging portion 22, an insulator block engaging portion 24, and a terminal connecting portion 26, shown best in FIG. 3. With respect to the wire-engaging portion 22, a first ferrule 28 is arranged to circumferentially engage the insulated portion of the wire 8. Above the first ferrule 28, structure is provided in the form of a second ferrule 30 so that the connector 10 may be electrically connected to the conductor portion of the wire 8, the second ferrule 30 being adapted to circumferentially engage the metal wire. Being that the terminal 10 is of

stamped sheet metal construction, the ferrules 28, 30 are presented to the wire 8 in an open position (not shown). Thereafter the ferrules 28, 30 are crimped into engagement with the wire 8 in a manner which resists withdrawal of the wire from the terminal 10.

The central portion of the terminal 10 consists of the insulator block engaging portion 24. Wing-like, lateral flanges 32 are arranged longitudinally above the second ferrule 30 and extend in a diametral plane in opposite directions from one another, shown best in FIGS. 1 and 3.

In function, the wing flanges 32 arrest inward movement of the connector 10 with respect to the insulator 6 by engaging the bottom wall surface of the first counterbore 14, clearly shown in FIG. 1.

Interjoining the confronting edges of the wing flanges 32 is a semi-cylindrical back portion 34 which extends downwardly to the second ferrule 30 and upwardly to merge into a frusto-conically shaped body 36. The body 36 resembles a skirt which has a lower marginal extent exceeding the upper marginal dimension whereby the portion of the body 36 is sized to be slidably received within the bore 12, as shown in FIG. 1. The shape of the skirt element 36 affords a degree of resilience in a radial plane, the springiness being enhanced by the reduced peripheral extent of the metal forming the skirt 36 as well as by the slot 20 assuming an inverted V-shape therealong.

A rib 40 protrudes outwardly from the skirt 36 opposite from the V-slot 20. The rib 40 cooperates with the bulging portions along the lower margin of the skirt 36 to guide the terminal 10 through the bore 12 and to maintain the skirt 36 in resilient engagement with the walls of the bore. Further the rib 40 serves to maintain the terminal 10 in predetermined alignment with respect to the bore 12.

Surmounting the skirt 36 is a pair downwardly directed spring fingers 42, each arranged on an opposite side of the terminal 10. Being struck from the side walls of the terminal 10 in the region of the skirt 36, the free ends of the fingers 42 extend towards the wing flanges 32 and are disposed laterally apart a distance somewhat greater than the widest lateral dimension of the skirt 36. Thus, as a terminal 10 is inserted through the bore 12, the fingers 42 are compressed inwardly against the skirt 36 and snap outwardly when full insertion of the terminal 10 is effected. When the terminal is in the fully inserted position, the ends of the fingers 42 engage the shoulder defined by the cylindrical walls of the bore 12 and the facial surface of the counterbore 16.

The distance between the free end of the fingers 42 and the edges of the wings confronting them, is selected in direct correspondence to the distance between the first and second shoulders in the respective counterbores 14, 16. From the above, it follows that the cooperation between the spring elements 42 and the wings 32 effects longitudinal movability of the terminal 10 with respect to the insulator block 6. Further, the arrangement of the flared skirt 36 and the protruding rib 40 maintains a centering action of the terminal 10 within the bore 12 and thus maintains the terminal 10 in an upwardly extending, outright position with respect to the insulator block 6.

The above described elements are all found in a female form terminal illustrated in FIGS. 6-8 which is designated generally by the numeral 60. Because parts of the male terminal 10 are complementary to those of the female terminal 60, such parts are given the same numeral designations with a prime (') being added. There now will be described the points of dissimilarity between the terminals 10 and 60, the male terminal 10 being considered first.

The head or terminal engaging portion 26 of the male terminal 10 is dome shaped at its outermost end thereby to define a head portion surmounting a somewhat narrowed neck 44. Downwardly from the neck 44 there is

disposed a substantially cylindrical shaped section 46 which merges with the narrow portion of the skirt 36.

The head or terminal engaging portion 66 of the female terminal 60 is open at its outermost end and flares somewhat outwardly to define a rim 68. Longitudinally below inwardly the rim 68 the female connector 60 includes a cylindrical tubular portion 70 which merges into the narrowest portion of the skirt 36. On each side of the tubular portion 70 there is provided a dimple 62 which projects inwardly each toward the other.

Cooperation between the male terminal 10 and female terminal 60 to effect an electrical connection therebetween is afforded by the complementary dimensions of the one element to the other and by the fact that the opposed dimples 62 seat in the neck 44 when the male unit is inserted into the female unit 60.

Should it be desired, the terminals of the type disclosed herein may be made in small sizes, for example, they may have an overall length of $\frac{3}{4}$ of an inch from end to end. Preferably, the terminals 10, 60 are formed in chains of interconnected units from thin sheet metal stock, each terminal in the chain being connected to another along the longitudinal edge of the lateral flange 32 or 32'.

The terminals 10, 60 made from thin sheet metal possess a higher degree of resiliency than those made from solid metal stock, i.e. screw machine products. It has been found that the solid pin-type terminals withstand very little misalignment without distortion where, on the other hand, the terminals of the type disclosed herein, both male and female, are able to stand substantial distortion and recover their shape and retain their utility.

It is also to be recognized that the male 10 and female 60 terminals are interchangeable in that either can be used in a plug or receptacle having the bore and counterbores like that of the block 6. When a plurality of terminals 10, 60, are fitted to a terminal block each terminal projects outwardly from the block in an outstanding erect manner. Should it be desired to remove any one of the terminals, it is only necessary that the spring fingers 42 be depressed into the sides of the skirt 36 and the terminal pushed through the bore 12. Depressing the fingers 42 does not permanently deform them but rather the resilience of the material is maintained so that such a terminal may be reinserted into a block for further use.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. An electrical connector comprising an insulating body having a bore therethrough with means defining oppositely outwardly facing shoulders contiguous with said bore relatively adjacent the opposite ends of said bore, and a resilient metallic terminal member comprising a substantially tubular body having a longitudinal slot extending from end-to-end thereof, said body having a forward end and a rear end, said rear end flaring outwardly substantially frusto-conically to engage the walls of said bore snugly, a pair of resilient retainer wings struck from said body on opposite sides thereof substantially in a common diametral plane, said wings being integral with said body relatively toward the forward end and extending diagonally out away from one another and toward the rear of said body and terminating short of said rear end to snap over and engage one of said shoulders of said insulating body to resist unauthorized withdrawal of said terminal rearwardly of said body, said terminal further having a shank rearwardly of said body including a pair of oppositely displaced flanges substantially in said common plane and having substantially right angle shoulders engageable with the other of said shoulders of said insulating body to resist unauthorized withdrawal forwardly, said shank rearwardly of said pair of flanges having means

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for gripping a bare wire and additional means for gripping insulation on such a wire.

2. An electrical connector as set forth in claim 1 wherein said longitudinal slot is substantially in a diametral plane at right angles to the diametral plane of said wings, said body flaring primarily in the direction of said slot from the diametral plane of said wings, said body having an integral radial protuberance on the side opposite said slot and substantially in the diametral plane of said slot, said protuberance being longitudinally substantially aligned with said outwardly flaring body rear end.

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