June 15, 1965 J. P. AVERY 3,189,869

ELECTRICAL CONNECTORS

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FIG. 1

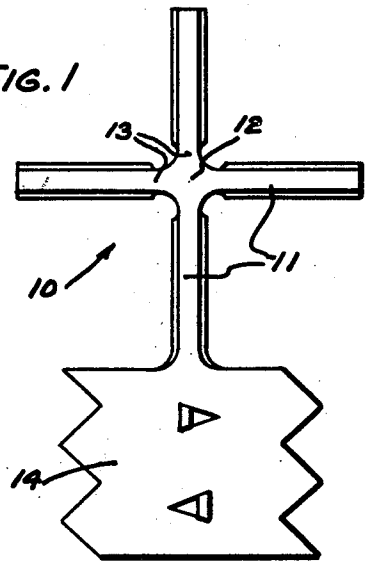


FIG. 3

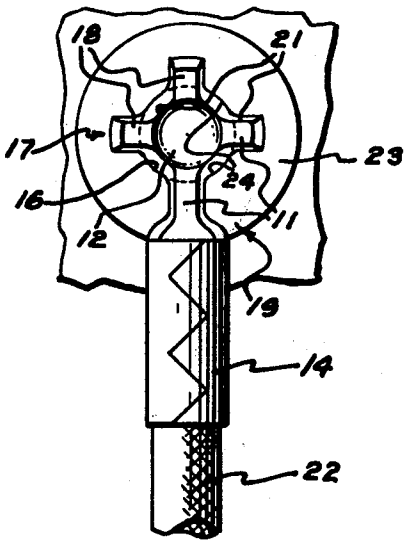


FIG. 2

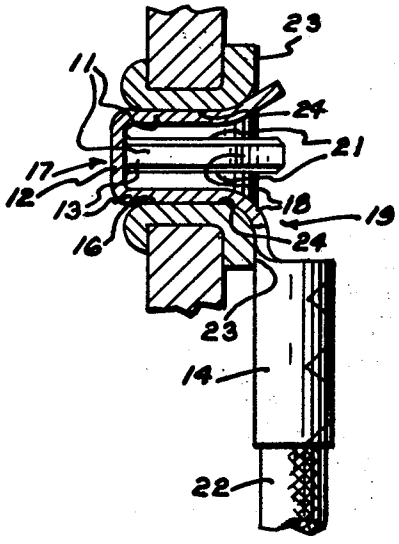
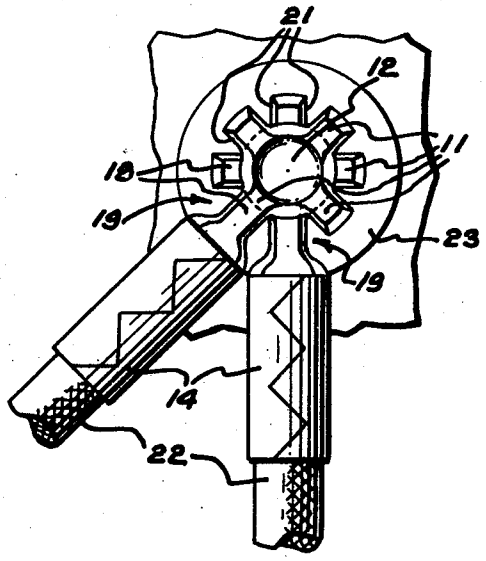


FIG. 4



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FIG. 6

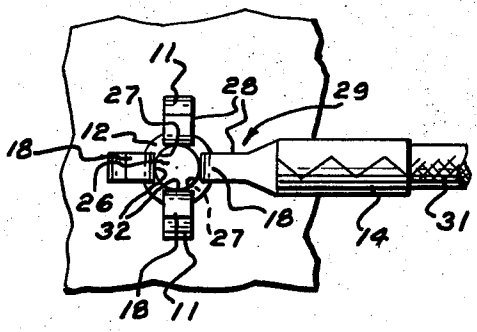


FIG. 7

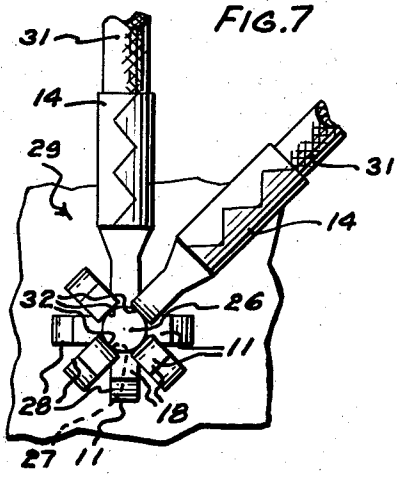


FIG. 5

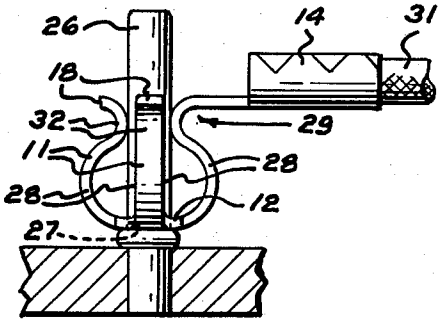
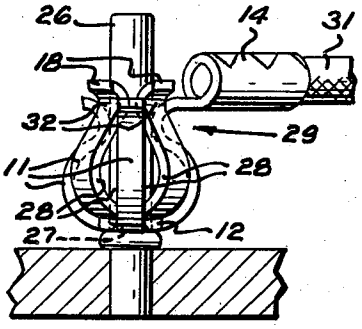


FIG. 8



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ELECTRICAL CONNECTORS

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6 Claims. (Cl. 339—258)

The present invention relates generally to electrical connectors and more particularly to electrical quick-connect connectors capable of successively nesting similarly constructed connectors. The general objects of the invention are to provide new and improved connectors of such character.

In the past, electrical connectors were a known expedient for efficiently effecting the simple connection of a single conductor to a single terminal. As such, they took on almost every conceivable shape in satisfying the specific requirements of each of a variety of installations, but required no major changes in their fundamental design. With the advent of the so called quick-connect connector, however, the related arts demanded a single-hand-movement, quick-connect connector in almost every application. At about this same time, another problem was recognized, pointing out further shortcomings of the prior connectors and even shortcomings of the new quick-connect connectors. Namely, the increasing complexity of electric and electronic circuitry dictated that several conductors be connected to the same terminal, a task which conventional connectors as well as quick-connect connectors were not equipped to accommodate.

Additional objects of the invention, therefore, are to provide new and improved connectors having quick-connect facilities, which connectors also have facilities enabling multiple connections to a single terminal to be completed simply, efficiently, and effectively.

A few connectors have already been developed which embody a provision for interconnecting successive connectors, one on top of another, to connect several conductors to a single terminal. Specifically, those connectors consist of a body portion having a socket in one end, separate and distinct from a connecting facility on the other end. Thus, the space of two conventional connectors placed one on top of the other is required for one interconnecting connector, rendering the use of such connectors less efficient than conventional noninterconnecting connectors.

Therefore, further objects of the present invention are to provide new and improved electrical connectors capable of successively nesting similarly constructed connectors which combine the heretofore separate connector and socket facilities into a unitary socket-within-a-connector facility, such as, for example, a socket within a plug-in projection.

Still further objects of the invention are to provide new and improved quick-connect, nesting connectors which are self-locking within a terminal socket or about a terminal post and which are self-locking one within another.

The foregoing and other objects are accomplished in accordance with the invention by a connector having a body portion formed by laterally spaced legs fabricated of sheet metal, the legs being joined and cross-linked at one end. The legs are so constructed and arranged that, when making electrical connection with a terminal, nesting is permitted of at least one other connecter of similar construction by accommodating the legs of the nested connector in the spacings defined between the legs of the nesting connector.

In accordance with a first embodiment, the legs of such body portion are generally parallel and collectively extend unidirectionally from their joined and cross-linked ends. Connectors of this design are utilized in conjunction with an electrical socket-type terminal and form therewith a nest for receiving similarly constructed connectors.

A connector in accordance with a second embodiment is provided with a body portion having bowed legs which are convergent at their free ends, and further having an aperture in the cross-linked end thereof. Such connectors are utilized in conjunction with a terminal post, the body portion being slid over the post so that the post is received through the aperture and between the free ends of the legs to make both mechanical and electrical connection thereto.

Other objects, advantages, and aspects of the invention will appear from the following detailed description of several specific embodiments thereof when taken in conjunction with the appended drawings in which:

FIG. 1 is a plan view of a connector blank which is subsequently formed and shaped into either of several preferred embodiments;

FIG. 2 is an elevational view, shown in cross section, of a first preferred embodiment utilized in conjunction with a terminal socket;

FIG. 3 is a plan view of the preferred connector of FIG. 2;

FIG. 4 is a plan view of the connector of FIG. 2 with a second, similarly constructed connector nested therewithin;

FIG. 5 is an elevational view of a second preferred connector, utilized in conjunction with a terminal post;

FIG. 6 is a plan view of the connector of FIG. 5;

FIG. 7 is a plan view of the connector of FIG. 5 with a second, similarly constructed connector nested therewithin; and

FIG. 8 is an elevational view of the nested connectors shown in FIG. 7.

Directing attention now to the drawings, several preferred embodiments, described in detail hereinbelow, can all be formed from an initial connector blank **10** illustrated in FIG. 1. This advantageous feature is derived from the identical fundamental design inherent in each of the preferred connectors, and further, in all of the connectors of the present invention. The connector blank **10** is exemplary of this fundamental design; it is fabricated of resilient sheet metal with a plurality of laterally spaced legs **11—11** extending radially outward from a common center **12**, joining and cross-linking at one end **13**. Each connector blank **10** further includes a conductor-sleeve blank **14**, formed at the remote end of one of the legs in the first embodiment.

The above-described fundamental design is characteristic of all connectors of the present invention, though the specific details of construction may vary. The number of legs **11—11** as well as the width of the legs, and therefore of the spacings therebetween, may be varied to suit the needs of a specific application without departing from such fundamental design. Once the number and width of the legs **11—11** is decided upon, however, connector blanks **10—10** of the same identical design can be fabricated for use in conjunction with a terminal socket or a terminal post, in accordance with the preferred embodiments disclosed below.

With reference now to the first preferred embodiment depicted in FIG. 2, the connector blank **10** is preformed for use in conjunction with a terminal socket **16**. The legs **11—11** are bent substantially perpendicular to the center **12** at their joined and cross-linked ends **13—13** so that the legs are parallel and collectively undirectional, to form a body portion **17**. To complete the fabrication of the body portion **17**, the legs **11—11** are flared outwardly at their free ends **18—18**.

With such configuration, the completed connector **19** is provided with spacings **21—21**, shown in FIG. 3, de-

fined between the legs 11—11, which spacings permit nesting of one such connector 19 within another when making electrical connection. The width of the spacings 21—21 is dependent upon the number and width of the legs 11—11, as well as the radius at which the legs are bent perpendicular to the center 12. To make such electrical connection, the completed connector 19 is fastened to a conductor 22 by crimping the sleeve blank 14 thereabout, and the connector is then inserted in the terminal socket 16.

Self-locking of the connector 19 within the socket 16 is assured by fabricating the body portion with an outer diameter slightly greater than the inner diameter of the socket, and by inserting the connector into the socket until the flared ends 18—18 of the legs 11—11 engage the entrance surfaces 23—23 leading into the socket. Thus, the legs 11—11 are subjected to a slight amount of deformation when inserted into the socket 16, and due to the inherent resilience of the sheet metal, press outwardly against the walls 24—24 of the socket.

With a first connector 19 so inserted in the socket 16, similarly constructed connectors 19—19 can be nested also within the socket, as illustrated in FIG. 4. The spacings 21—21 defined between the legs 11—11, provide for such nesting by accommodating the legs of the nested connector in immediate contact with the walls 24—24 of the socket. It is obvious that the number of connectors 19—19 that can be successively nested one within another, is dependent upon the number and width of component legs 11—11 thereof.

In the second preferred embodiment of the invention, depicted in FIGS. 5 through 8, the connector blank 10 is preformed for use in conjunction with a terminal post 26. In preforming connectors of this embodiment, the legs 11—11 are bowed radially outward from the center 12 at their joined and cross-linked ends 13—13, and are initially convergent and then divergent at their free ends 18—18, as depicted in FIGS. 5 and 6. In addition, an aperture 27 is provided in the center 12 for accommodating the terminal post 26.

As in the first embodiment, such configuration provides spacings 28—28 defined between the legs 11—11 of the completed connector 29, which spacings permit necting of one such connector 29 within another when making electrical connection. The connector 29 is fastened to a conductor 31 by crimping the sleeve 14 thereabout, and the connector is slid over the terminal post 26 so that the post is received through the aperture 27 and is resiliently gripped between the convergent portions 32—32 of the legs 11—11. In this case, self-locking of the connector 39 on the post 26 is assured by making the inner diameter defined by the convergent portions 32—32, slightly less than the outer diameter of the post.

With a first connector 29 so inserted over a terminal post 26, similarly constructed connectors 29—29 can be nested also about the post and within the first connector, as is illustrated in FIGS. 7 and 8. The spacings 28—28, as in the first embodiment, provide for such nesting by accommodating the legs 11—11 of the nested connector, the convergent portions 32—32 of the nested connector being in immediate contact with the post 26.

Thus, several connectors have been described in detail hereinabove, all of which embody quick-connect and nesting features. All of the above-described connectors are similar in that they are provided with laterally spaced legs which define spacings for accommodating the legs of similarly constructed connectors to thereby permit nesting of one connector within another. It is contemplated therefore, that while several preferred embodiments have been described in detail hereinabove, it will be obvious that various modifications can be made without departing from the spirit and the scope of the inventive concept.

What is claimed is:

1. An electrical connector capable of nesting similarly shaped connectors, comprising:

a blank fabricated of sheet metal and formed into a base with a plurality of nest-defining legs extending outwardly therefrom, said legs being bent through substantial angles to one side of said base to positions wherein they are circumferentially spaced from one another and resiliently yieldable to engage frictionally an electrical terminal to which connection is to be made,

at least one of said legs having a receptacle integrally formed at the free end thereof and extending outwardly at a substantial angle from said nest-defining legs for making external connection to a conductor,

said connector, while frictionally engaged with a terminal, forming a nest for receiving similarly shaped connectors as a result of the spatial interrelation of said base, said legs and said receptacle, the legs of the nested connectors being accommodated in interleaved fashion in the spaces defined between the legs of the nesting connector.

2. An electrical connector and terminating member capable of nesting similarly shaped connectors, comprising:

an electrical terminal, and

a connector fabricated of sheet metal and formed into a base with a plurality of nest-defining legs extending outwardly therefrom, said legs being bent through susbtantial angles to one side of said base to positions wherein they are circumferentially spaced from one another and resiliently yieldable to engage frictionally said electrical terminal,

at least one of said legs having a receptacle integrally formed at the free end thereof and extending outwardly at a substantial angle from said nest-defining legs for making external connection to a conductor,

said connector, while frictional engaged with said terminal, forming a nest for receiving similarly shaped connectors as a result of the spatial interrelation of said base, said legs and said receptacle, the legs of the nested connectors being accommodated in interleaved fashion in the spaces defined between the legs of the nesting connector.

3. An electrical connector and socket arrangement capable of nesting similarly shaped connectors, comprising:

a connector fabricated of sheet metal and formed into a base with a plurality of nest-defining legs extending outwardly therefrom, said legs being resiliently yieldable and being bent through substantial angles to one side of said base to positions wherein they are generally parallel to and circumferentially spaced from one another,

at least one of said legs having a receptacle integrally formed at the free end thereof and extending outwardly at a substantial angle from said nest-defining legs for making external connection to a conductor, and

an electrical socket-type terminal frictionally engageable by said resiliently yieldable nest-defining legs of said connector, and forming therewith a nest for successively receiving similarly shaped connectors as a result of the spatial interrelation of said base, said legs and said receptacle, the legs of the nested connectors being accommodated in interleaved fashion in the spaces defined between the legs of the nesting connector.

4. An electrical connector capable of nesting similarly shaped connectors, comprising:

a blank fabricated of sheet metal and formed into a base with a plurality of nest-defining legs extending outwardly therefrom, said legs being resiliently yieldable and being bent through substantial angles to one side of said base to positions wherein they are gen-

erally parallel and circumferentially spaced from one another to engage frictionally an electrical socket-type terminal, the free ends of said legs being flared outwardly to facilitate the positioning and the retention of the connector within the socket; and

at least one of said legs having an integral sleeve-forming receptacle at the end thereof, extending outwardly at a substantial angle from said nest-defining legs, which may be crimped about a conductor to make electrical connection therewith;

said conector, while frictionally engaged in an electrical socket, forming therewith a nest for receiving similarly shaped connectors as a result of the spatial interrelation of said base, said legs and said receptacle, the legs of the nested connectors being accommodated in interleaved fashion in the spaces defined between the legs of the nesting connector.

5. An electrical connector capable of nesting similarly shaped connectors, comprising:

a blank fabricated of sheet metal and formed into a base with a plurality of nest-defining legs extending outwardly therefrom, said legs being resiliently yieldable and being bent through substantial angles to one side of said base so that they are bowed and circumferentially spaced from one another, the free ends of said legs being convergent and said base having an aperture therethrough so that an electrical terminal post, to which connection is to be made, may be received through the aperture in said base and frictionally engaged by the free ends of said legs,

at least one of said legs having an integral sleeve-forming receptacle at one end thereof, extending outwardly at a substantial angle from said nest-defining legs, which may be crimped about a conductor to make electrical connection therewith,

said connector, while frictionally engaged with a terminal post, forming a nest for receiving similarly shaped connectors as a result of the spatial interrelation of said base, said legs and said receptacle, the legs of the nested connectors being accommodated in interleaved fashion in the spaces defined between the legs of the nesting connector.

6. An electrical connector and terminal post arrangement capable of nesting similarly shaped connectors, comprising:

a connector fabricated of sheet metal and formed into a base with a plurality of nest-defining legs extending outwardly therefrom, said legs being resiliently yieldable and being bent through substantial angles to one side of said base so that they are bowed and circumferentially spaced from one another, said legs having convergent portions near the ends thereof and being flared outwardly again at their free ends, and said base having an aperture therethrough,

at least one of said legs having a receptacle integrally formed at the free end thereof and extending outwardly at a substantial angle from said nest-defining legs for making external connection to a conductor, and

an electrical terminal post frictionally engageable by said resiliently yieldable nest-defining legs of said connector, said connector receiving said terminal post through the aperture in said base to permit frictional engagement of said terminal post with said legs, and said connector, when received over said terminal post, forming a nest for successively receiving similarly shaped connectors as a result of the spatial interrelation of said base, said legs, and said receptacle, the legs of the nested connectors being accommodated in interleaved fashion in the spaces defined between the legs of the nesting connector.

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