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3,002,045

ELECTRICAL CONNECTOR

Filed Dec. 3, 1959

FIG. 1

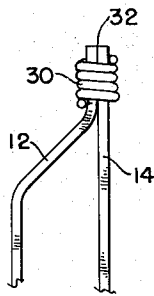


FIG. 2

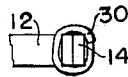


FIG. 3

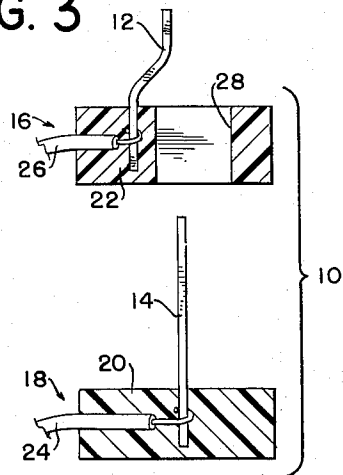


FIG. 4

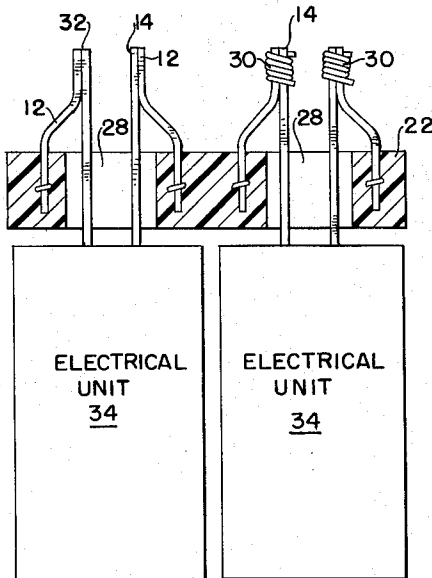
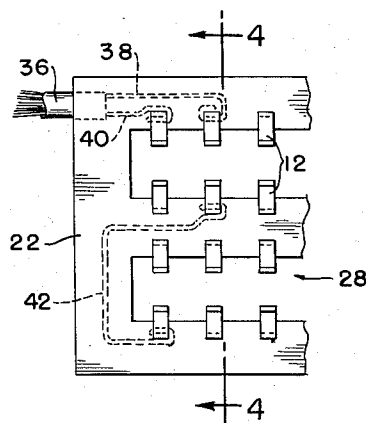


FIG. 5



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**ELECTRICAL CONNECTOR**

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5 Claims. (Cl. 174-88)

This invention relates to electrical connection means and more particularly to an improved method of electrically connecting two conductors with a helically wrapped third conductor. The invention also relates to an improved multi-terminal connector assembly employing this improved connection method.

The invention employs the well known wrapped wire solderless connection in a novel manner to obtain improved electrical connection between pairs of comparatively rigid terminals. In the past, the wrapped wire technique was used to connect a solid wire lead to a single terminal pin and was merely coiled tightly about the pin. In the present invention, the tightly wrapped wire is employed as a third element to connect two independent terminals, and provides full mechanical and electrical connections therebetween.

The improved terminal connection method is particularly suitable in one form to an improved multipin connector assembly. Upstanding rectangular terminal portions are embedded in the male and female halves of the connector to which the required lead connections are made. The female half is provided with an aperture which allows passage of the male terminal to an adjacent position with the terminal on the female member. Naturally, a multiplicity of terminals may be incorporated on the connector halves so that many circuits can be conveniently joined. In this multi-terminal connector form, the connector halves require extremely low joining force in comparison to prior art connectors not employing the wrapped wire fastening technique.

It can also be seen that the terminal pin alignment on both the male and female parts is comparatively un-critical due to their flexibility and the eventual wrapping of the terminals together. The tolerance build-up problem is of major importance in prior art connectors employing large numbers of terminal pins. The invention substantially reduces tolerance considerations and is particularly useful when required to connect to conductors which emerge from encapsulated electronic assemblies in a relatively uncontrolled dimensional relation to one another.

The invention is equally adaptable to connecting circuit terminals having non-rectangular shapes as well as to connecting more than two terminals in a bunch. The efficiency of the electrical bond between the circuit terminals is primarily determined by the existence of longitudinal corners or edges on the terminals to which the wrapped wire in tension may make contact. Surface contact between the terminals provides a secondary electrical path insuring a low resistance electrical connection.

An object of the invention is to provide an improved method of connecting electrical terminals.

Another object of the invention is to provide a reliable low cost multi-pin connector assembly having extremely low insertion force requirements.

Still another object of the invention is to provide a connector assembly in which dimensional variations in terminal placement are non-critical.

A further object of the invention is to provide an electrical connection which is simple in design, reliable in operation and economical to manufacture.

For a better understanding of the nature of the invention, reference should be had to the accompanying drawings in which:

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FIG. 1 is a side elevation view, partly broken, showing the circuit terminals joined with a spirally wrapped coil;

FIG. 2 is a top plan view of the terminal connection shown in FIG. 1;

FIG. 3 is an exploded view in cross section of a single pin connector;

FIG. 4 shows a multi-pin connector assembly as applied to typical electrical units in partial section taken along line 4-4 of FIG. 5; and

FIG. 5 is a broken top plan view of the multi-pin female connector half shown in section in FIG. 4.

A single pin electrical connector 10 is shown in exploded relation in FIG. 3. The connector is composed of a female plug half 16 and a male plug half 18 having contact terminals 12 and 14, respectively. The contact terminals 12 and 14 are embedded in their associated insulating base portions, respectively, 22 and 20. These base portions may be fabricated or molded from any suitable insulating plastic material. The upstanding contact terminal 12 has connected to its lower portion a wire 26, while the contact terminal 14 has connected to its lower end a wire conductor 24. The insulating base 22 of the upper or female member has an aperture 28 which provides a passageway for the insertion of the contact terminal 14 upon joining of the two connector halves. When joined, the two contact terminals will assume an adjacent relationship above the upper surface of the insulating block 22. The relationship of the parts upon the joining of the connector halves can be more fully appreciated with references to the views in FIGS. 1 and 4, wherein the contact terminals have been mechanically and electrically secured by a helically wound wire 30. This connecting wire is wrapped in a tight tensioned fashion about the rectangular pair of terminals 12 and 14 in such a manner that positive electrical connection is insured therebetween. The helically wrapped wire 30 provides both electrical conduction between the terminals 12 and 14 and mechanically compresses their adjacent surfaces together to form a good electrical bond.

In FIG. 4 a connector employing a multiplicity of terminal contacts is shown in cooperation with electrical units 34 and 34 from which protrude a multiplicity of contact terminals 14. In this view the left hand portion of the connector is shown prior to wrapping of the wire about the terminals and shows the surface contact area 32 between the terminal contacts. In the right hand portion of the same figure the electrical connections have been made between the respective terminal pins.

The top view of a female connector half is shown in FIG. 5 wherein the contact terminals 12 are spaced about a rectangular opening 28 in the insulating base 22. A multi-conductor cable 36 has typical conductor wires 38 and 40 attached to the lower embedded ends of adjacent contact terminals. A conductor 42 is integrally molded within the base 22 to thereby electrically interconnect any desired contact terminals 12 in the base.

It can be readily understood how the invention easily provides a multi-pin connection device which is non-critical to tolerance build-ups in view of the inherent flexibility of the contact terminals. The wire wrapping connection method used to electrically and mechanically secure pairs of contact terminals also allows for dimensional variations in the parts themselves. It should be understood that the invention is in no way limited to connection of only pairs of contact terminals by a wrapped helical wire, but can just as readily be applied to advantage in securing two or more contact terminals of any one of various cross sectional shapes.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be under-

stood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. An electrical connector comprising male and female members made of insulating material, at least one upstanding substantially rectangular terminal embedded in said female member adjacent an aperture therein, at least one substantially rectangular terminal embedded in said male member extending through a corresponding aperture in said female member and adjacent a portion of a corresponding upstanding terminal in said female member, multi-turn spirally wrapped conductive wire means electrically and mechanically connecting adjacent terminals, and a plurality of conductors embedded in the male and female members connecting said terminals in predetermined fashion.

2. An electrical connector comprising male and female members made of insulating material, a plurality of upstanding substantially rectangular terminals secured to said female member adjacent the opposite edges of a rectangular aperture therein, a second plurality of upstanding substantially rectangular terminals secured to said male member extending through the rectangular aperture in said female member, each of said terminals being adjacent a portion of a corresponding upstanding terminal in said female member, conductor means in at least one of said members electrically interconnecting said terminals in predetermined fashion, and means electrically and mechanically connecting corresponding terminals of said male and female members, said means including a multi-turn spirally wrapped conductive wire in tension about corresponding terminals of said members.

3. An electrical connector comprising a male and a female member made of insulating material, a plurality of upstanding terminals secured to said female member adjacent the edges of apertures therein, a second plurality of upstanding terminals secured to said male member and extending through the apertures in said female member and in substantial parallel registry with a portion of

a corresponding upstanding terminal of said female member, means electrically and mechanically connecting corresponding ends of said terminals, said means including a multi-turn spirally wrapped conductive wire in tension about said terminals, and conductor means in at least one of the members electrically interconnecting selected terminals of the member in predetermined fashion.

4. A female connector for engagement with a male member having upstanding terminals thereon, said female connector comprising a body portion of insulating material, a plurality of upstanding terminals secured to said body portion adjacent the edges of apertures therein, said terminals being adapted to be electrically connected to corresponding terminals of the male member extending through said apertures by multi-turn spirally wrapped conductive wire means in tension about said terminals, and conductor means in said body portion interconnecting selected upstanding terminals of said female connector in predetermined fashion.

5. An electrical connector comprising a first portion of insulating material and a second portion of insulating material, said first portion including a plurality of upstanding polygonal cross-section terminals secured therein, said second portion including a plurality of upstanding polygonal cross-section terminals secured in substantial parallel alignment with corresponding terminals of said first portion, multi-turn spirally wrapped conductive wire means electrically and mechanically connecting corresponding terminals of said first and second portions, and conductor means in at least said first portion electrically interconnecting selected terminals of said portion in predetermined fashion.

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