Nov. 17, 1964 E. T. DERKAS 3,157,734

DOUBLE WIRE WRAP CONNECTION OF JUXTAPOSED TERMINALS

Filed Dec. 26, 1962

FIG. 1.

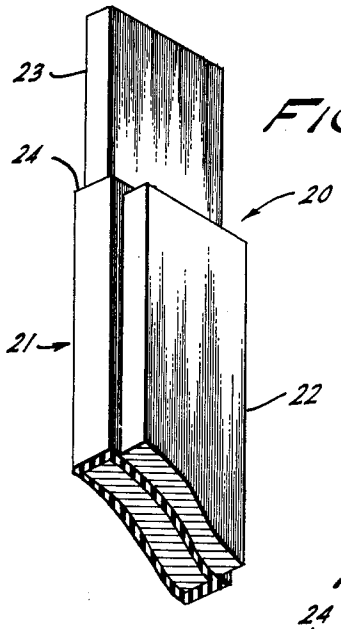


FIG. 7.

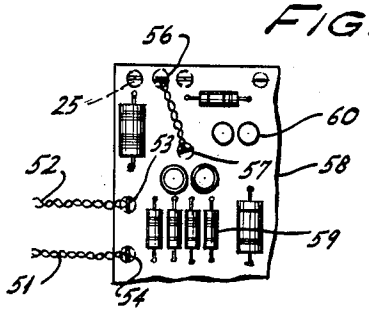


FIG. 8.

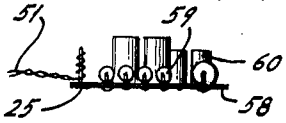


FIG. 3.

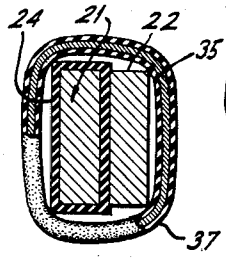


FIG. 4.

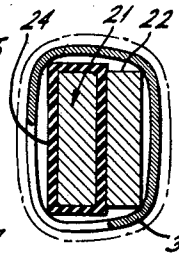


FIG. 5.

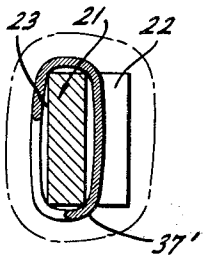
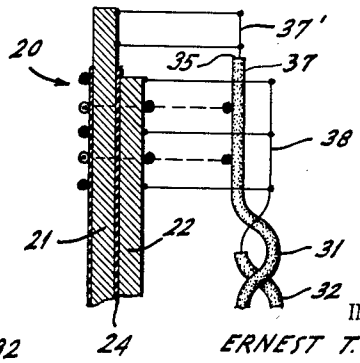


FIG. 2.

FIG. 6.



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DOUBLE WIRE WRAP CONNECTION OF JUXTAPOSED TERMINALS

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5 Claims. (Cl. 174—88)

This invention relates to electrical connector systems and to novel ways of producing the same. It provides closely associated connections, especially with wire-wrap contacts, and also provides concurrent establishment thereof. The new technique can be used for instance to connect a signal carrying wire with one terminal post while concurrently connecting a shield wire with a closely adjacent terminal post. While of broader utility, the technique has particular application to systems and operations wherein twisted pairs of wires are used and where the circuit carrier or support structure is of the printed circuit type.

It has long been desired to improve the construction of closely associated electrical connections. Rapidity of operation has been desired, along with firmness of resulting connector structures. Another object is to provide electrical connections in extremely crowded areas of a circuit panel. These and other objects, to be noted hereinafter, are promoted by the technique disclosed herein, which provides a pair or series of connector posts, one closely adjacent and parallel to the other, with a peculiar pattern of insulation and exposure of bare metal on said posts and with a special way of concurrently wrapping bare and insulated wire end portions on this pair of posts. This will now be described in greater detail with reference to the drawing appended hereto, wherein:

FIGURE 1 is a greatly enlarged, fragmentary, perspective view of an upper end portion of one of the pairs of connectors as it appears initially. FIGURE 2 is a view of a completed lug and wire structure, the orientation of this view being similar to that of FIGURE 1. FIGURES 3, 4 and 5 are sectional views taken respectively along lines 3—3, 4—4, and 5—5 in FIGURE 2. FIGURE 6 is a highly schematic representation of the lug and wire elements, indicating the concurrent operations performed thereon. FIGURE 7 is a fragmentary plan view of a circuit panel with the newly formed lug units thereon and FIGURE 8 is an edge view of this panel.

As indicated in FIGURE 1, a connector unit 20 is initially provided which comprises a plurality and particularly a pair of posts or lugs 21, 22, each desirably of rectangular cross section. A first lug 21 is of relatively long upward extension and comprises a metallic core 23, with a coating of electrical insulation 24 surrounding the outside of a lower portion of this core, while the other lug 22 is relatively short and consists entirely of uninsulated metal. The two lugs are closely juxtaposed so that a side surface of the short or bare metal lug lies against a side surface of the insulation on the longer lug. This insulation of the first lug 21 extends upwardly to a point slightly above the upper end of the adjacent, shorter, bare metal lug 22. Metallic core 23 of lug 21 extends further upwardly from this point, beyond insulation 24. Lowermost portions of lug unit 20 are soldered to a circuit board or the like, as schematically indicated in FIGURE 8 at 25.

The new technique involves concurrent wrapping of a pair of wires 31, 32 on this pair of lugs 21, 22 to produce the structure, shown in FIGURE 2, wherein metal of wire 31 contacts metal of lug 21 while metal of wire 32 contacts metal of lug 22, exclusively. This concurrent wrapping can be effected either by hand or by some suitable tool of the wire wrapping type, not shown. In either

case distinctive interrelationships of the two wires and two lugs are established in accordance with the invention, as best shown in FIGURES 3 to 5. The individual method steps involved in the establishment of these arrangements are analyzed schematically in FIGURE 6.

With reference to FIGURES 2 and 6 it is to be noted that the two wires 31, 32 have, respectively, wire cores 33, 34, with insulations 35, 36 thereon, and that they have terminal portions 37, 38 extending in parallel untwisted strand form, whereas the body of the two wires, other than these terminal portions, desirably extends as a twisted strand. Terminal portion 38 of short wire 32 is shown as being entirely stripped of insulation, whereas only a final part 37′ of the other terminal portion 37 is stripped to expose bare metal of the longer wire core. Thus it will be seen that the shorter, bare terminal portion 38 and a juxtaposed, insulated part of longer terminal portion 37 are wound on the lower surfaces of the pair of lugs, which surfaces expose insulation of lug 21 on one side and metal of lug 22 on the other side, whereas metal 37′ of the longer terminal portion 37 is wound on the uppermost, bare metal end of lug 21.

Referring more particularly to the method of producing the lower portion of the new wire wrap structure shown in FIGURE 2, the structure can be produced by simultaneously winding bare metal of short wire portion 38 and insulated parts of long wire portion 37 around the two lugs, thereby alternately contacting these wire elements (FIGURES 3 and 4, respectively) with insulated portions of the longer lug 21 and with bare metal of the shorter lug 22. In this way the metal cores of ground and signal wires 31, 32 are contacted respectively and selectively with lugs 21, 22. Although the two lugs, as well as the two wires, are closely juxtaposed, no metal contact is made between lug 21 and wire 32, or between lug 22 and wire 31. The selective contacting operations are performed substantially simultaneously, and also within most narrowly limited space, thereby greatly facilitating performance thereof when circuit components and terminals are closely packed on a wiring panel or circuit structure.

Referring in more detail to FIGURES 2 to 6, it will be seen that the shorter wire 32, which can for instance serve as signal wire, is here illustrated as having terminal core portion 38 bent into four or five wire coils surrounding the pair of lugs, each of these coils having two points or areas of metal contact with the bare terminal 22, at points which appear at the right side of FIGURE 4. The parallel portion 37 of the other or ground wire 31 extends and curves along with the so connected signal wire. This second wire makes no contact with the bare metal of terminal 22, by virtue of the wire insulation 35, FIGURE 3. The resilience of such insulation, along with the resilience of lug insulation 24, contributes advantageously to the firmness of metal-to-metal contact, established at successive corners of bare wire metal 38, FIGURE 4.

In the very schematic illustration of FIGURE 6, distinctive symbols are used along the surfaces of lug 20 to represent different types of contact. Metal-to-metal contacts are here indicated by small black dots, contacts of metal with an insulator are indicated by large black dots, and mutual contacting of insulated elements is indicated, on these surfaces, by the use of double circles concentrically drawn. It will be seen that the first and lower phase of the new wire-winding operation involves (I) as to bare wire portion 38, successive steps of (1) establishing metal-to-metal contacts (see the small dots on 22) and metal-to-insulation contacts (see the outer large dots, on 21), concurrently with (II) successive establishment of metal-to-insulation contacts (inner large dots, on 22) and of insulation-to-insulation contacts (open circles on 21), for section 37 of insulated wire 31. In a

final and upper phase, ordinary metal-to-metal contacts are made for terminal portion 37' of this wire 31 (small dots).

As indicated in FIGURE 7 it is possible by this new technique to connect wire pairs 51, 52 with lug units 53, 54 either at one end of each wire pair (51, 52) or at both ends thereof (56, 57). It is believed to be unnecessary at this point to describe other features of the supporting circuit board 58 and additional electronic components 59, 60 thereon. The new product or connector system, as best indicated by FIGURES 2 and 6, is characterized in that parallel long and short metallic lugs (21, 22), closely juxtaposed but insulated from one another (24), have adjacent long and short wires (31, 32) wound thereon with limited, selective metal contact, the metal of the short wire contacting no metal but that of the short lug and the metal of the long wire contacting no metal but that of the long lug. By means of such arrangement, double or multiple wire connections can be made in circuit panel areas of unprecedented smallness.

While only a single embodiment of the invention has been fully described, the details thereof are not to be construed as limitative of the invention. The invention contemplates such variations and modifications as come within the scope of the appended claims.

I claim:

1. A double wire-wrap structure comprising:

a pair of parallel and closely adjacent, metallic posts, one longer than and insulated from the other; and

a pair of wires, one longer than and insulated from the other wire, insulated from the shorter post and wire-wrapped on an end portion of the longer post to make electrical connection between said longer wire and longer post, both wires being wrapped around the pair of posts below said end portion, and the shorter wire being insulated from the longer post and in wire-wrap contact with the shorter post to make electrical connection between said shorter wire and shorter post.

2. A structure as described in claim 1, including insulative material surrounding the longer post below said

end portion thereof to provide the insulation of the longer post from the shorter post and from the shorter wire.

3. In a multiple electrical terminal structure:

a system of parallel, juxtaposed, rigid metallic lugs insulated from each other, comprising first and second lugs; and

a system of juxtaposed, flexible metallic conductors extending along portions of each other and around the system of rigid lugs, the first flexible conductor being insulated from the second rigid lug and being electrically connected with the first rigid lug, and the second flexible conductor being insulated from the first rigid lug and being electrically connected with the second rigid lug.

4. In a structure as described in claim 3, the feature that said lugs have rectangular cross-section with sharp corners for deforming metal of the conductors.

5. An electrical connector structure for signal and ground wires and the like, comprising:

a relatively tall metallic lug with an insulative coating around a lower portion thereof;

a relatively low metallic lug in contact and parallelism with said coating;

a relatively long wire having an exposed metallic core as an end portion thereof and having insulative material around a preceding wire portion, said wire being wound around both lugs with said insulative material contacting said insulative coating and relatively low metallic lug, said core contacting said relatively tall lug above said coating to electrically connect said relatively long wire with said relatively tall lug; and

a relatively short wire, having an exposed metallic core as an end portion thereof wound around both lugs between windings of the relatively long wire to electrically connect said relatively short wire with said relatively low lug.

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