

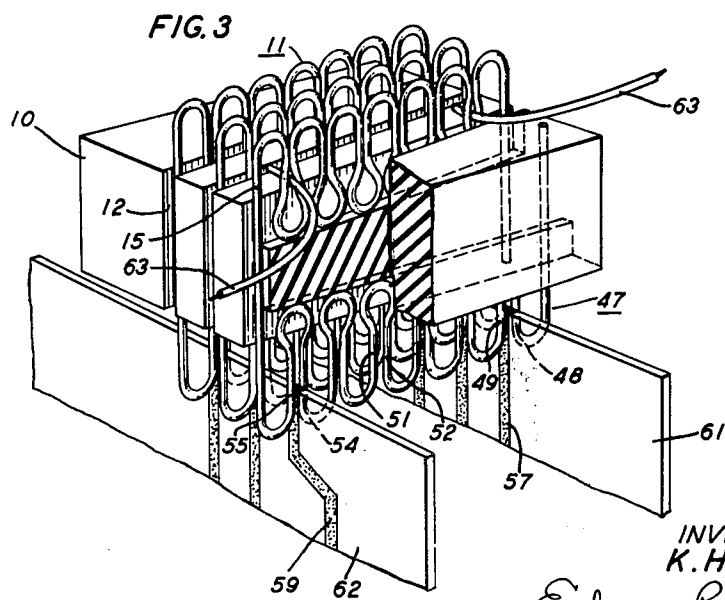
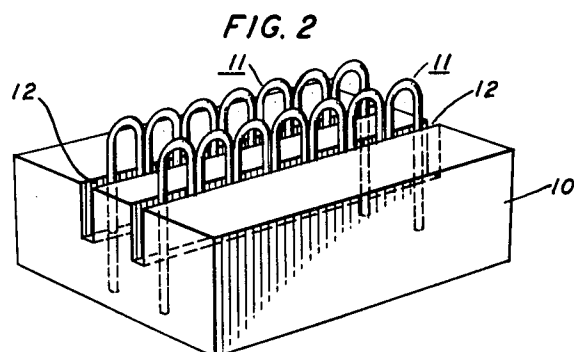
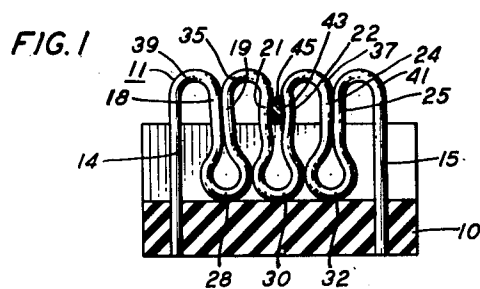
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WIRE FORMED SOLDERLESS MULTIPLE CONNECTOR

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WIRE FORMED SOLDERLESS MULTIPLE CONNECTOR

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This invention relates to solderless, electrical connectors.

In many applications, particularly in the telephone art, it is necessary to make multiple interconnections between small-diameter, insulated conductors in confined spaces where the use of screw-type terminal strips or similar connecting devices is undesirable. In addition, it is often difficult to effectively strip insulation from such small conductors without materially damaging the conductor surfaces or to hold them in position while connector components are manipulated to perfect fastening. The desirable features of known solderless connectors in this regard are offset by the number and size of components usually found in such connectors, or the alternative difficulty of tinning the contact surfaces of one piece, solderless connectors without materially inhibiting their ability to penetrate the insulation wall covering the conductor. Heretofore known methods of forming solderless connector structures from round wire stock overcome these difficulties but are generally unacceptable in applications such as those regularly encountered in the telephone art where high connector to conductor interfacial contact pressures are essential in order to perfect a noiseless connection.

It is an object of this invention to provide high contact pressure, solderless connections which will have a low noise factor.

It is another object of this invention to provide conductor interconnections without the necessity of stripping insulation therefrom.

It is also an object of this invention to form an interconnection bank from electrically conductive wire stock which may be tinned without materially inhibiting its ability to penetrate conductor insulation walls.

Still another object of this invention is to perfect multiple conductor interconnectors with a minimum of manipulation in a limited physical space.

This invention achieves these objects by forming a series of pairs of parallel abutting wire sections from springy, electrically conductive wire stock such that the abutting surfaces are pressed against each other by the spring bias of looped sections formed from continuations of the wire stock and located at the ends of the abutting contact sections. This invention can be better understood by reference to the attached drawing in which:

FIG. 1 is a cross section through a connector block unit of one embodiment of the invention;

FIG. 2 is a perspective view of the connector shown in section in FIG. 1; and

FIG. 3 is a perspective view of another embodiment of this invention.

Referring first to FIG. 1, depicted therein is a cross section of an insulation block 10 in which is imbedded a solderless multiple interconnector device 11 formed from a continuous filament of round, springy, electrically conductive wire stock, such as a bronze containing phosphorus. The extreme ends of this filament are formed into straight sections 14, 15 extending through the block perpendicularly to its top and bottom surfaces. Intermediate these straight sections are paired contact sections 18, 19; 21, 22; and 24, 25. Each of the sections has a common abutting surface with its associated pair member, and the members of each pair are separated from each other by closed loops 28, 30, 32 also formed from the

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same wire filament. The adjacent contact members of adjacent pairs (i.e. 19, 21; 22, 24) are separated from each other by semicircular loops 35, 37 or, in the case of the endmost contact sections 18, 25 by semicircular loops 39, 41. When a conductor 43 is thrust between one of the pairs of contact members 21, 22, the contact members are actively forced toward each other through operation of the spring effect of the closed loop 30 and the open loops 35, 37 acting on opposite ends of the pair of contact members. This causes the facing surfaces of the contact sections 21, 22 to penetrate the insulation wall 45 surrounding the conductor 43 and to come into firm physical and electrical contact with the conductor. The closure pressure on the upper ends of the contact sections 21, 22 established by the open loops 35, 37 is a function of the inherent springiness of the loop members augmented by the tendency of the outermost end of each of the open loops to resist positional dislocation due to its structural integration with the next adjacent contact members 19, 24 which bear against their associated contact pair members 18, 25. Similarly, the closure pressure on the upper ends of the endmost contact members 18, 25 is perfected by the inherent springiness of the open loops 39, 41 and their tendency to resist positional dislocation because of structural integration with the straight sections 14, 15. The closure pressure of the lower ends of the contact sections is established by the inherent springiness of the wire stock in the closed loops 28, 30, 32. The closure effect of these double cantilever structures acting on the ends of the contact sections of each pair causes the wire forming the contact sections to easily penetrate the insulation wall of an insulated conductor inserted therebetween, and to contact the conductor with great force, thereby establishing a firm, positive electrical contact. In addition, the insulated conductor tends to be retained in a location intermediate the ends of the contact sections due to the application of closure pressure at the contact section ends. This is a marked improvement over the heretofore utilized "scissor" effect of applying closure pressure from one end of a pair of solderless wire-formed connector contact surfaces, the natural tendency of which was to expel rather than retain the conductor, and in which high pressure contacts could not assuredly be maintained.

FIG. 2 illustrates several interconnector units 11 imbedded within the insulation block 10 parallel to each other and with their open loops located above the top surface of the block. The interconnector devices reside in slots 12 cut in the upper face of the block to accommodate them. The advantage of using such slots as opposed to totally surrounding the connector devices with the material of the insulation block is in fully utilizing the augmenting effect of each adjacent contact pair operating through the open loop members.

FIG. 3 illustrates another embodiment of this invention wherein an interconnector device 11 similar to that illustrated in FIG. 2 is imbedded in a slot 12 in an insulation block 10 but is directly connected through a straight section 15 of the same wire filament to a second interconnection device 47 whose contact surfaces face 180 degrees away from the contact surfaces of the first interconnection device. The second interconnector device 47 has its contact members 48, 49; 51, 52 and 54, 55 spaced so that they will readily accommodate and yet firmly bear upon the conductor paths 57, 59 of printed circuit boards 61, 62. Through use of this embodiment, a common electrical interconnection between the printed circuit boards 61, 62 and electrical conductors 63 inserted between the contact members of the first interconnector device 11 may be perfected.

It is to be understood that the embodiments of the invention herein set forth are only illustrative and that

numerous other embodiments may be made by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A multiconductor unit comprising insulation block with contact assembly banks formed from round, springy, electrically conductive wire imbedded therein, said banks comprising pairs of parallel abutting contact members each member of which is joined to its associated member by a common continuum of round wire in the form of a closed loop and each member of which is joined to the adjacent contact member of the next adjacent pair group by a common continuum of interconnecting round wire in the form of an open loop, said banks terminating in straight members extending through said insulating block and joined to the adjacent contact member of the next adjacent contact pair group by a common continuum of round wire.

2. An electrical connector comprising a block of insulating material having slots therein wherein are imbedded contact units, the latter comprising continuous lengths of round, springy, electrically conductive wire, each of said lengths of wire having pairs of straight contact sections extending vertically from the top surface of said insulating block and joined to the next adjacent section of the next adjacent pair of straight contact sections by a semicircular continuum of wire common to said adjacent sections, said pairs of straight contact sections being joined together within said slot by a closed circle formed from a common continuum of said wire, the endmost straight sections of each of said units being interconnected with sections of said wire extending completely through said insulation block by means of a common semicircular continuum of said wire.

3. An electrical connector comprising a continuous round wire conductor former in a series of loops extending alternately in opposite directions, said loops having abutting sides an insulator block imbedding the wire ends and those loops extending in the same direction as said

wire ends, said loops that are imbedded in said block being closed loops and said loops that are not imbedded in said block being semicircular loops, the abutting sides of the non-embedded loops define insulation-penetrating slot boundaries, said boundaries grip and make electrical contact with an insulated wire.

4. A printed circuit board connector comprising an insulating block having a first and second surface, said block having imbedded therein a conductor compression connector strip formed from a continuous length of round electrically conductive resilient wire stock, said strip having first and second electrically interconnected portions, said first portion having pairs of abutting straight contact sections, and said second portion having pairs of spaced apart straight contact sections, said straight contact sections of each pair being joined to each other within the block by common closed loops of wire, each of said straight sections being joined to the adjacent straight section in the next adjacent pair of straight contact sections by means of common semicircular loops external to said block, said first portion and said second portion being so imbedded in said block that said straight contact sections of said first portion are extended perpendicularly from said first surface of said block and said contact sections of said second portion are extended perpendicularly from said second surface of said block.

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