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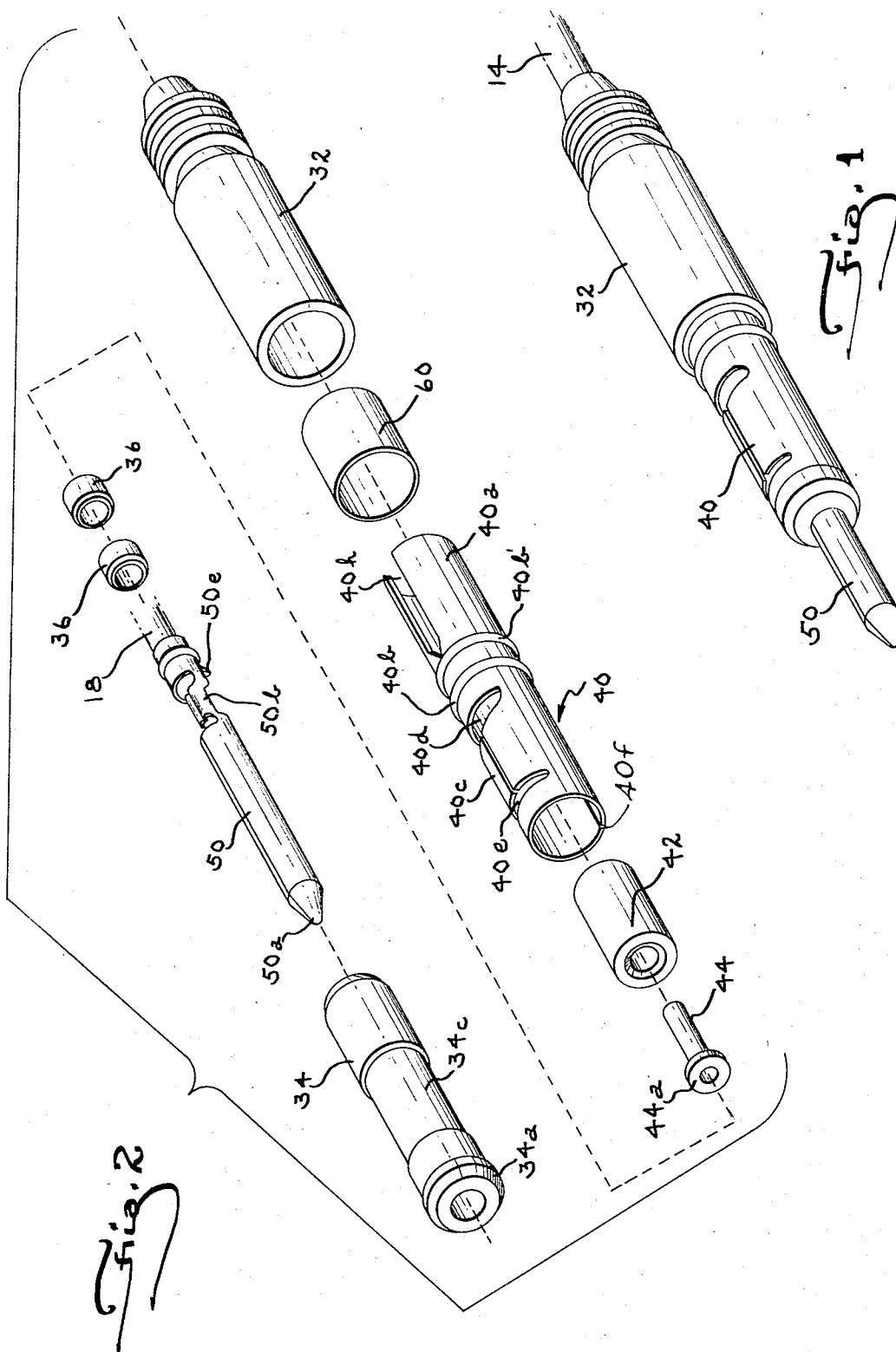
K. N. KAROL

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COAXIAL PATCHCORD ASSEMBLY

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COAXIAL PATCHCORD ASSEMBLY

Kenneth Norman Karol, Harrisburg, Pa., assignor to

AMP Incorporated, Harrisburg, Pa.

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ABSTRACT OF THE DISCLOSURE

A patchcord assembly is provided having a large contact area which mates with an aperture in a circuit panel. The contact area comprises a spring section of oppositely directed C-shaped or semicircular members having a relatively low spring constant.

This invention relates to an improved coaxial terminal device of the type utilized in plugboards.

There are many presently known types of plugable electrical contactors. These contacts are utilized for establishing electrical continuity between a current carrying coaxial cable and a selected one of a series of socket contacts placed in a plugboard. The plugable contactors are subjected to many insertions and withdrawals relative to the plugboard. A critical design requirement of such contactors is that the insertion and withdrawal forces exerted between the contactor and its corresponding socket must be held within close limits. The force must be small enough to permit the ready insertion of the contactor into the plugboard. However, the force must be large enough to prevent the contactor from becoming dislodged accidentally from the board aperture.

One example of a prior art plug contactor is that shown in U.S. application Ser. No. 356,279 filed Mar. 31, 1964, now Patent No. 3,284,755, and having a common assignee with the instant invention. The contactor of the copending application, although commercially successful, has drawbacks which are overcome by the present invention. These drawbacks reside chiefly in the configuration of the springs utilized for exerting the force between the contactor and the plugboard. These springs consist of a series of axially extending runners which ride within the aperture in the plugboard and exert the necessary forces. These runners have an objectionable galling effect on the aperture in the plugboard. Further these runners are secured at both ends in a manner producing a spring with a relatively high spring constant. Necessary manufacturing tolerances in these runners produces slight variation in the dimension of the runners. This variation results in a change in the amount of deflection which the runners will undergo when inserted within the board. Any change in deflection when multiplied by a rather high spring constant results in an appreciable change in the amount of force developed. Since the amount of this force must be kept within close limits there are many parts which cannot satisfy customer requirements and therefore must be discarded resulting in a substantial economic loss to the manufacturer.

It is therefore an object of the invention to provide a plugable electrical contactor or terminal for coaxial cable which avoids the drawbacks of the prior art.

It is a further object of the invention to provide a coaxial contactor wherein the inner and outer conductive members are crimped to the inner and outer conductive paths of coaxial cable.

It is another object of the invention to provide a coaxial contactor of the type adapted to be plugged into a board and to be retained therein against accidental withdrawal.

Other objects and attainments of the present inven-

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tion will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings, in which like reference numerals refer to like parts:

FIGURE 1 is a perspective view of a plugable contactor constituting a preferred embodiment of the present invention;

FIGURE 2 is an exploded perspective view of the contactor of FIGURE 1 showing the various parts in their unassembled position;

FIGURE 3 is a top plan view showing the contactor of FIGURE 1 mounted in a plugboard;

FIGURE 4 is a side cross-sectional view of the plugable contactor; and

FIGURE 5 is a cross-sectional view taken along the line 5—5 of FIGURE 4.

Referring now to FIGURES 1 and 3 numeral 10 identifies a board member apertured as at 11 to receive the contactor assembly of the invention shown as 30, which effectively terminates a coaxial cable 14. Board member 10 may be a portion of a connector block or may be part of a plugboard assembly having hundreds or thousands of apertures such as 11 into which large numbers of contactors 30 may be inserted to, in effect, program connections between leads such as 14 and thereby between computer components connected to such leads. The board 10 may be of an insulating material such as phenolic resin; diallyl phthalate or the like, or may be of metal such as aluminum with the apertures 11 molded or drilled therein. As previously stated one of the requirements for contactor 30 is that it have a fixed insertion and withdrawal force in an axial sense so as not to become dislodged accidentally from the board aperture. An accidental dislodgement could arise by reason of some force or blow striking the end of the contactor shown as pin 50, or in plugboard use by reason of a plugboard spring member shown dotted in as 51 engaging pin 50. In plugboard use contactor 30 must be frequently withdrawn from the aperture 11 and reinserted in some other aperture to effectively change the program to that desired. As a further requirement contactor 30 must and should provide a shielding of the center conductive path of cable 14 which is continuous from the cable itself up to and through the board 10.

Contactors 30 accomplishes the above requirements by including an assembly separately terminating the inner and outer conductive paths of cable 14 to spaced and separate conductive paths insulated each from the other by a dielectric material. The assembly components are shown generally as 40, a conductive metallic sleeve forming the outer conductive path and 50, a conductive metallic pin forming the inner conductive path, with 40 and 50 being spaced apart and insulated each from the other by a dielectric insert 34. The rear portion of contactor 30 is surrounded and captivated by an insulating boot 32 made of rubber, plastic, or some other insulating material. During insertion and withdrawal the contactor assembly 30 is normally gripped by means of boot 32 to avoid placing undue strains on cable 14. With the construction of the present invention, however, the connector assembly can, if it is necessary, be withdrawn by pulling upon cable

14 without destroying the connection between the cable conductors and the conductive components of the assembly. In prior art devices wherein the conductive paths of the cable were soldered to the components of the connector, pulling forces applied on cable 14 frequently cracked the solder band to cause a connection failure. This is avoided in the assembly of the invention in a manner to be hereinafter described. Referring now to FIGURES 2 and 4 the outer conductive path of cable 14 is extended through the assembly 30 by means of the shell or sleeve 40 which is of conductive metallic material having spring characteristics. The rear portion of 40, shown in FIGURE 2 as 40a, is terminated to a ferrule member 42 which in turn is connected to the outer conductive braid 16 of cable 14 by means to be described. The portion 40a is relieved as at 40h to provide upon crimping a working of the outside surface of 42 to lock 40 to ferrule 42 with respect to relative rotational movement between the members. A second ferrule member 60 is disposed around portion 40a of the shell or sleeve 40 and aids upon crimping in insuring electrical continuity between the braid 16, ferrule 42 and shell 40.

Extending forwardly from portion 40a is a portion carrying a pair of circumferential rings 40b and 40b'. The ring 40b serves to limit the inward travel of the contactor into aperture 11 of board 10. The ring 40b' serves as an abutment which lies at the forward end of the boot 32 and hence protects the end of the boot from accidental damage. The pair of rings 40b and 40b' present a corrugated section which greatly enhances the rigidity of the sleeve 40 and aids in maintaining the sleeve in its cylindrical configuration.

Forward of the rings 40b and 40b', and as an integral part of sleeve 40, is a section 40c of enlarged diameter and as best seen in FIGURE 5 is in the form of a pair of oppositely directed C-members. The section 40c will be reduced in diameter upon insertion of the contactor into the board 10 and will exert a tight frictional spring action which operates to hold assembly 30 within the board. The C-shaped configuration of section 40c has two distinct advantages over the prior art configurations. First it can be appreciated that the contact area between assembly 30 and board 10 will extend over the entire surface of portion 40c in contradistinction to the spring runners of the prior art. By utilizing the entire surface there is no danger of galling the apertures 11 in board 10. Secondly the C-shaped configuration provides a spring with a relatively low spring constant, that is a relatively low force will produce a relatively large spring displacement and stated conversely a relatively large displacement of section 40c will produce a relatively low spring force. This feature is very important in that as already stated the manufacturing of the shell 40 will result in slight variations in dimensions in the section 40c which variations will result in varying amount of displacements of the section 40c when the assembly 30 is inserted within the apertures 11 in board 10. However, due to the low spring rate of the section 40c these slight variations in the extent of movement of section 40c will result in negligible variations in the force produced and thus the insertion and withdrawal forces of the assembly 30 can be maintained within very close limits.

The forward portion of sleeve 40 extends outwardly to an end engaging a flange 34b of the insert 34. This end portion, as seen in FIGURE 2, serves to clinch the shell 40 to the insert 34. The forward portion of the shell is separated from the spring portion 40c by an aperture 40e. The spring section 40c is separated from the rear portion 40a by an aperture 40d, the apertures 40d and 40e being joined by the gap 40g extending through the section 40c. The shell 40 is formed generally of tubular configuration and is split along its entire length as indicated at 40f.

As can be seen from FIGURE 4 the sleeve 40 extends well back over the cable 14 and is commoed to the ferrule member 42 which is relatively thick and preferably

of a malleable material such as annealed copper. Ferrule 42 is made to extend over a substantial portion of cable 14 and is, in cooperation with ferrule 60, crimped inwardly thereagainst over a portion of the cable outer insulating sheath 15 and inwardly against the cable braid 16 against a metallic backing ferrule 44. The backing ferrule 44 is of a harder material to resist crushing of the cable dielectric 18 by the crimp applied to ferrules 42 and 60. The braid 16 is then thus terminated to the ferrule assembly 42 and 44 and thereby to the sleeve 40 to extend the conductive path of the cable along the contactor assembly to the end of sleeve 40 proximate flange 34b as shown in FIGURE 4. The backing ferrule 44 includes a flange 44a which is turned outwardly to define a surface against which the dielectric insert 34 is butted. The interior bore of ferrule 44 is slightly larger than the maximum diameter of the cable dielectric 18.

In the forward portion of sleeve 40, as best seen in FIGURE 4, the dielectric or insulating insert 34 includes a beveled end 34a adapted to facilitate insertion of the contactor within aperture 11 of board 10. Spaced along insert 34 and underlying the portion 40c of sleeve 40 is an annular relief or recess 34c provided in insert 34 to permit the spring section 40c to be compressed inwardly upon insertion of the contactor within aperture 11 of board 10 without compressing the insert material.

A major portion of insert 34 includes an inner bore shown as 34e of a diameter to receive the contactors central pin member 50 with a sliding fit. The rear portion of insert 34 includes a bore 34d of a slightly larger diameter to permit pin member 50 to be inserted in insert 34 and held against outward axial displacement. Except for the relieved portion 34c, insert 34 is in contact and gripped by sleeve 40 along its entire length. At the inner end of insert 34 proximate the ferrule members there is provided a pair of separate dielectric spacer inserts 36 which are included to facilitate assembly of the contactor assembly 30 and at the same time positively hold the central contact pin member 50 against accidental engagement with the outer conductive path at ferrule flange 44a.

The center conductive pin member 50 has a forward contact portion 50a and a central portion which is cut away and adapted to be formed as by crimping to mechanically and electrically connect the center conductor 20 of cable 14 to pin 50. The portion 50b is raised upwardly to provide clearance as at 50c and includes flanges 50d folded inwardly as shown in FIGURE 5. On at least one surface of central pin member 50 is a dimple 50e which extends radially to bite into and engage the material of insert 34 and prevent relative movement in a rotational sense between pin 50 and 40. Adjacent dimple 50e is an outwardly flared portion 50f which operates by engaging portion 34d to lock pin 50 against axial withdrawal from the contactor assembly. The sloped or tapered surface of 50f readily facilitates assembly of the pin within insert 34. Axial displacement of pin 50 to the left relative to the assembly is prevented by the dimple 50e and by the pin engagement with inserts 36 which in turn are butted against the flange 44a of ferrule 44. The conductive pin member 50 is thus mechanically secured to the insert 34 and to sleeve 40 and thereby to boot 32; thereby preventing rotational and axial movements of pin member 50 during insertion and withdrawal of the contact.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

What is claimed is:

1. In a plug contactor for use with a coaxial cable in-

cluding a central pin member crimped to the center conductor of the coaxial cable and a ferrule assembly crimped to the outer conductor of the coaxial cable and an insulating insert supporting said central pin member and including a radially relieved portion on the outer surface, the improvement comprising a metallic shell member disposed over said insulating insert and said ferrule assembly, the said shell member including a spring section of oppositely directed, substantially semicircular members positioned over the insert relieved portion and of a diameter adapted to engage the aperture of a board member with which the contactor is utilized and be driven inwardly into said relieved portion to frictionally hold said contactor within said bored member, said semicircular members forming together a substantially circular periphery, said semicircular members further being of substantial length in an axial direction to present a relatively large contact area for cooperation with the board member.

2. In a plug contactor as set forth in claim 1, said shell member further comprising a pair of circumferential rings constituting a corrugated section, said corrugated section serving to enhance the rigidity of said contactor.

3. In a plug contactor as set forth in claim 1, said spring section having an internal diameter which is larger than the external diameter of said insulating insert.

4. In a plug contactor as set forth in claim 1, a ferrule member disposed around said shell member adjacent the rearward portion thereof, said ferrule member serving to secure said shell member to said ferrule assembly.

References Cited

UNITED STATES PATENTS

2,708,740	5/1955	Taormina	339—205
2,983,895	5/1961	Pasik	339—217.3
3,072,880	1/1963	Olsson	339—221
3,107,964	10/1963	Wolf	339—205
3,245,030	4/1966	D'Amico	339—217
3,284,755	11/1966	Mummey et al.	339—221

FOREIGN PATENTS

605,822	9/1960	Canada.
852,563	10/1960	Great Britain.

MARVIN A. CHAMPION, *Primary Examiner.*

R. S. STROBEL, *Assistant Examiner.*