

Dec. 29, 1970

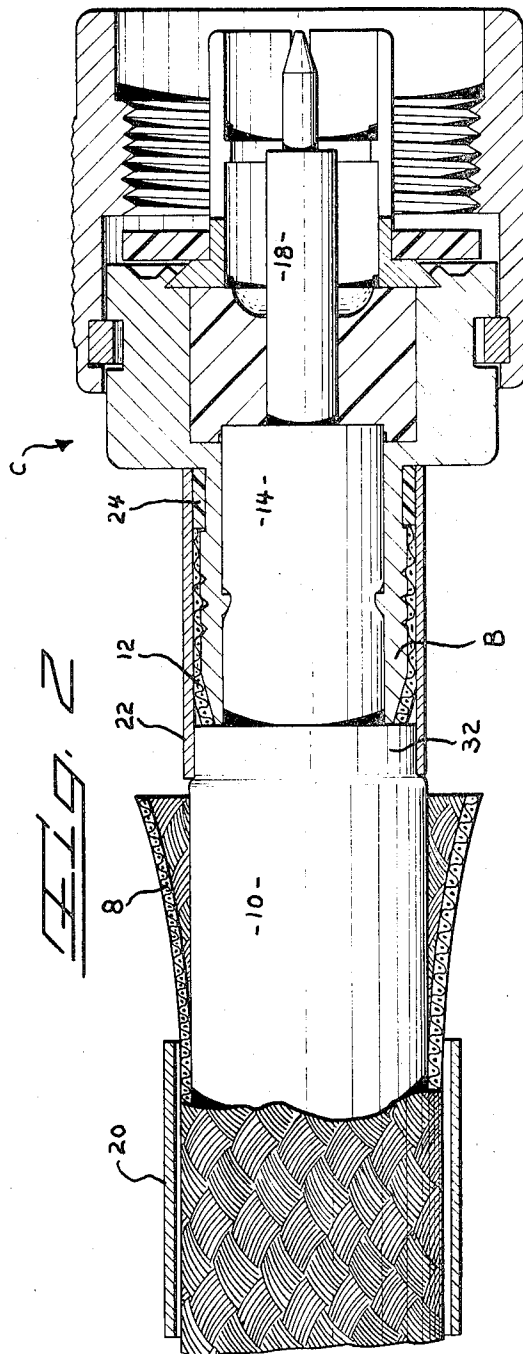
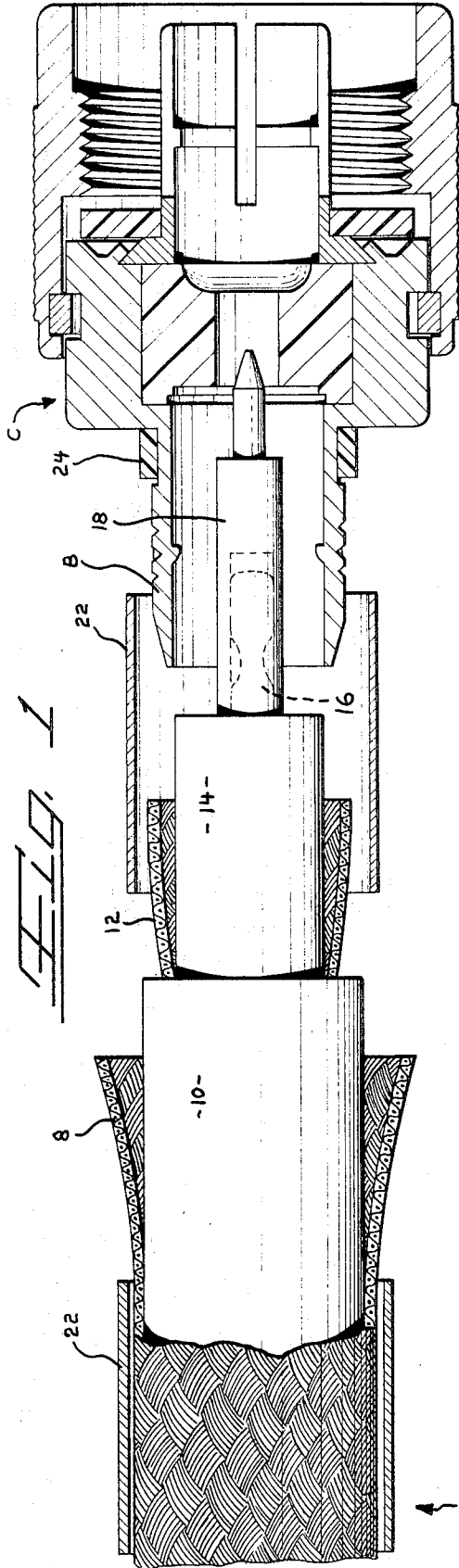
**M. F. O'KEEFE**

3,551,882

CRIMP-TYPE METHOD AND MEANS FOR MULTIPLE OUTER  
CONDUCTOR COAXIAL CABLE CONNECTION

Filed Nov. 29, 1968

2 Sheets-Sheet 1



INVENTOR.

MICHAEL FRANCIS O'KEEFE

BY

BY *John R Hopkins*

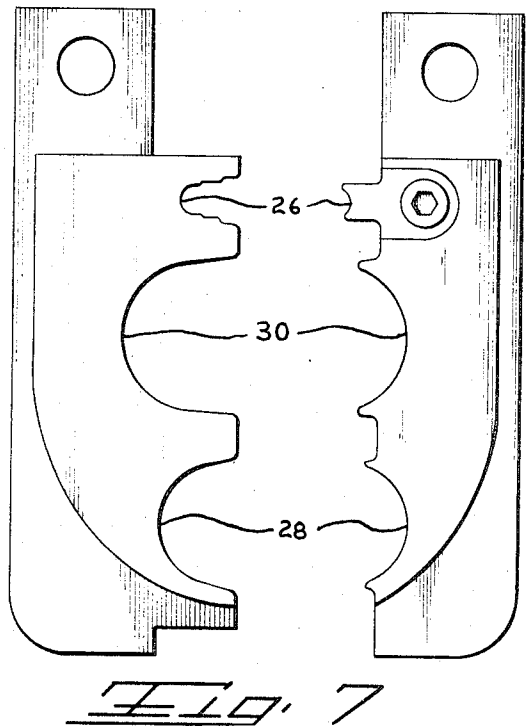
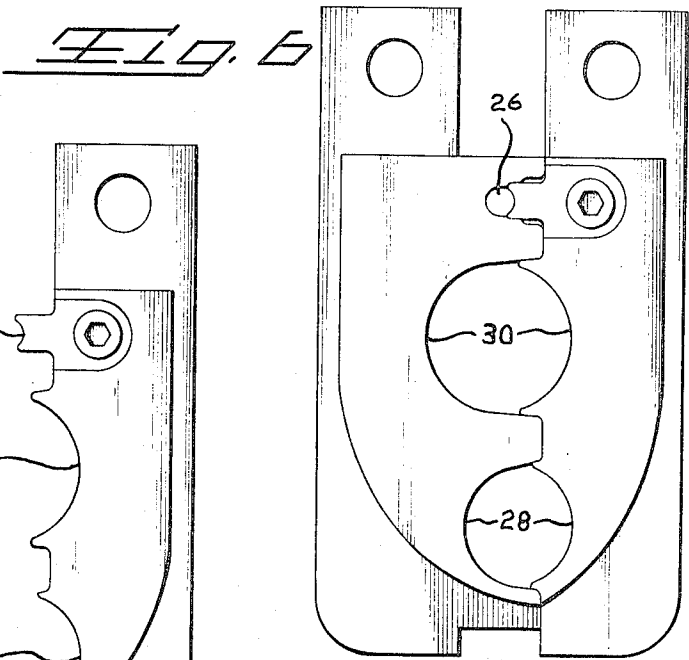
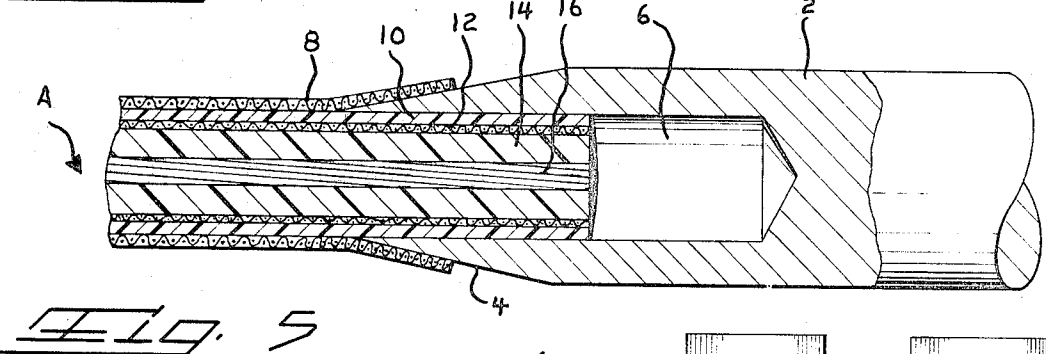
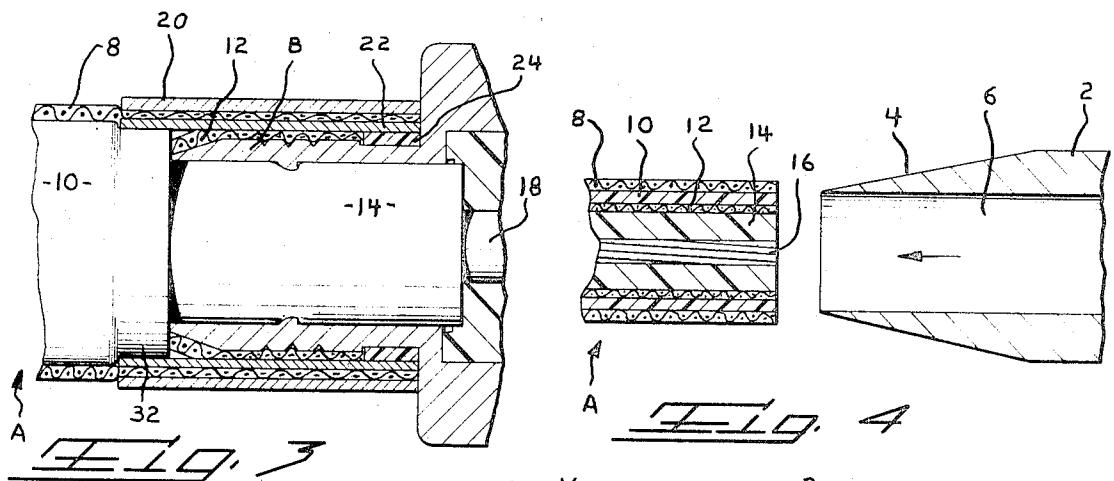
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INVENTOR.  
MICHAEL FRANCIS O'KEEFE  
BY *John R. Hopkins*

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## CRIMP-TYPE METHOD AND MEANS FOR MULTIPLE OUTER CONDUCTOR COAXIAL CABLE CONNECTION

Michael Francis O'Keefe, Mechanicsburg, Pa., assignor to  
AMP Incorporated, Harrisburg, Pa.

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3 Claims

### ABSTRACT OF THE DISCLOSURE

A method and means is disclosed for terminating coaxial connectors to coaxial cable of a type having two layers of outer braid. A malleable ferrule is crimped down onto the inner braid to terminate it to the connector and an outer ferrule is then crimped down onto the outer braid directly over the inner ferrule to join it to the connector.

### BACKGROUND OF THE INVENTION

In a connector of the type shown and described in U.S. Pat. No. 3,390,374 filed Sept. 1, 1965 and in similar connectors of this type, it is sometimes required that an armored cable be terminated thereto. Armored cable is described as a composite cable having a center conductor covered by subsequent layers of dielectric shield braid, cable jacket, and outer braid. One of the problems heretofore in terminating this cable has been to obtain a suitable mechanical connection between the outer armor braid and the connector proper. Prior art connectors have, for example, used a complicated multipart wedge or collet structure like that shown in U.S. Pat. No. 2,509,341 granted May 30, 1950, to terminate armor braid and maintain a mechanical connection.

### SUMMARY OF THE INVENTION

This invention relates to coaxial shielded cable of the type having an outer sheath of braid defining armor, and more particularly relates to a terminating technique for connecting crimpable connectors to such cable.

It is therefore a primary objective of the present invention to provide a crimpable coaxial cable terminating technique for cable having multiple layers of outer braid.

It is a further object of the present invention to terminate conventional crimpable connectors to multiple braid cable quickly and reliably.

It is yet another object of the present invention to provide a crimpable coaxial cable terminating technique for cable having multiple layers of outer braid.

It is yet another object of the present invention to provide improved connector terminating construction so as to obtain an improved electrical and mechanical connection.

It is still a further object of the invention to provide a terminating technique which may be utilized in terminating to shielded cable as well as armored cable.

Terminating of a double braid cable to a coaxial connector is accomplished in accordance with the present invention through the use of two ferrules which are positioned over each of the two braids of the cable after the cable has been stripped. A pin is crimped to the center conductor of the coaxial cable after which the pin and dielectric around the center conductor are inserted into a sleeve extension of the shell of the connector. After the pin and inner dielectric of the coaxial cable are inserted, the inner braid is positioned around the outside of the sleeve extension. An inner ferrule is positioned over the inner braid and sleeve extension and crimped. The armor or outer braid is formed around the crimped inner braid and inner ferrule after which an outer ferrule is brought

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into position thereover. The outer ferrule is crimped directly down over the inner ferrule completing the termination between the cable and the connector.

In the drawings:

FIG. 1 is a longitudinal, section view showing the ferrules, cable and connector with the center contact pin being inserted and the ferrules positioned on the cable before the cable is fully inserted into the connector;

FIG. 2 is a longitudinal sectioned view of the assembly showing the cable fully inserted into the connector and the inner braid crimped to the connector;

FIG. 3 is a partial section view of the cable and connector showing the outer ferrule crimped to the outer braid over the inner ferrule;

FIG. 4 is a sectioned view of the cable and a tool utilized in flaring the outer braid away from the cable dielectric;

FIG. 5 is a sectional view showing the flaring tool preparing the outer braid of the cable;

FIG. 6 is a plan view sketch illustrating the dies which may be utilized in terminating the cable to the connector parts with the crimping dies in the closed position; and

FIG. 7 is a view of the structure of FIG. 6 in an open position.

### DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to FIGS. 4 and 5 wherein the cable structure and its preparation for termination is shown, an armor expanding tool 2 having a conical nose 4 on one end thereof and having a cylindrical cavity 6 in that end is depicted approaching the end of a cable A. The inside diameter of cavity 6 approximates the outside diameter of the cable jacket 10. As tool 2 is positioned against the end of the armored cable and a force is applied thereto, the entire cable, except for outer armor braid 8, enters cavity 6. Because of conical-nose 4 of the tool being forced between armor braid 8 and cable jacket 10, the armor braid 8 opens radially in a bell-mouth fashion and at the same time compresses longitudinally as shown in FIG. 5. This arrangement disposes outer armor braid 8 back along the cable from the end thereof so as to permit underlying layers of the cable to be trimmed. Braid 8 may be held in longitudinal compression by an auxiliary means such as adhesive tape while tool 2 is removed. The cable is then prepared for termination by exposing predetermined lengths of center conductor 16, dielectric 14, inner braid 12, and cable jacket 10.

FIG. 1 there is shown a connector C and armored cable A. An armor crimp ferrule 20 is initially disposed on the cable away from the end thereof with an inner braid crimp ferrule 22 positioned over inner braid 12. At this time the center contact 18 has been crimped to the cable center conductor 16. When in the position of FIG. 1, the location of the cable A relative to the connector C is such that dielectric 14 is located within a rear backup sleeve B of connector C with inner braid 12 located around the outside of B. Crimp ferrule 22 is then positioned on the braid 12 and is circumferentially crimped down over B so as to terminate inner braid 12 to C. As ferrule 22 is crimped, a moisture-proof seal is effected by means of compressed sealing ring 24 on B and the circumferentially-compressed forward portion of cable jacket 10 as shown in FIG. 2 by numeral 32. This arrangement provides a first connection between the cable and the connector.

The armor crimp ferrule 20 as shown in FIG. 3 is positioned after the auxiliary holding means is removed permitting armor braid 8 to be moved toward the connector. Ferrule 20 is then pushed home and braid 8 is then located between ferrule 22 and ferrule 20. It is terminated thereto by circumferentially crimping ferrule 20 down onto outer braid 8 and the inner braid 22 as shown

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in FIG. 3. This arrangement provides the final mechanical connection between the cable and connector C.

A multi-crimp die set is provided as shown in FIGS. 6 and 7, which dies are detachably secured to a straight-action tool of the type shown and described in U.S. Pat. No. 3,345,856, granted Oct. 10, 1967. The center contact 18 is crimped to the center conductor 16 by means of the uppermost die 26. The inner braid ferrule 22 is crimped in the lower most die 28, and the outer armor braid ferrule 8 is crimped in the center die 30 thereby providing the three crimping stations utilized in terminating the armor cable A to the connector C.

The crimp preferred for use in crimping the braid ferrules 20 and 22 is taught in Re. Pat. No. 25,847 to E. W. Forney, Jr., granted Aug. 31, 1965, which is an O crimp. Other crimps are contemplated such as a hex crimp with proper alignment to avoid looseness.

In an actual embodiment ferrule 20 was approximately .625 inch in length and .626 of an inch in outer diameter. It was .031 of an inch in wall thickness and was made of copper. Ferrule 22 was approximately .625 inch in length and .477 of an inch in outer diameter. It was .020 of an inch in wall thickness and was made of copper.

The resulting termination provided an adequate connector for armor coaxial cable with respect to mechanical sealing, while acquiring maximum crimping pressure.

While the illustrative embodiment has featured an improved cable termination, the invention fully contemplates crimping of any kind of multi-braid cable with more than two braids or two or more equivalent outer conductors, such as foil or ribbon and the like.

What is claimed is:

1. A terminal connection for a shielded cable with a connector having a hollow body and a tubular sleeve extending therefrom, said shielded cable comprising and inner conductor surrounded by a dielectric casing, a conductive shield surrounding the casing, an insulating sheath having an outer diameter greater than the sleeve encasing the conductive shield, and an outer conductor shield

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encasing the insulating sheath, said connection comprising means mounting said inner conductor and dielectric casing in said tubular sleeve, means mounting said conductive shield on the outer surface of the said tubular sleeve with an end of the insulating sheath adjacent the end of the sleeve, means mounting the outer conductive shield over said tubular sleeve and the conductive shield mounted thereon, the means mounting the conductive shield comprising a ferrule surrounding the sleeve and the end of the insulating sheath and crimped over the sleeve and sheath to secure the shield on the sleeve and to form a seal with the sheath.

2. A terminal connection as defined in claim 1 further including an annulus surrounding the sleeve adjacent the body and compressed between the ferrule and sleeve to form a seal therebetween.

3. A terminal connection as defined in claim 2 wherein the means mounting the outer conductive shield comprises a ferrule crimped over the outer surface of the outer conductive shield to clamp said outer shield on the said inner ferrule.

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MARVIN A. CHAMPION, Primary Examiner

L. J. STAAB, Assistant Examiner

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