

- [54] **ELECTRICAL CONNECTOR**
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- [52] U.S. Cl. .... **174/89, 174/75 C, 285/246, 285/250, 339/177 E**
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- [58] Field of Search.. **174/88 C, 89, 75 C; 339/177 R, 339/177 E; 285/245-247, 250, 149**

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[57] **ABSTRACT**

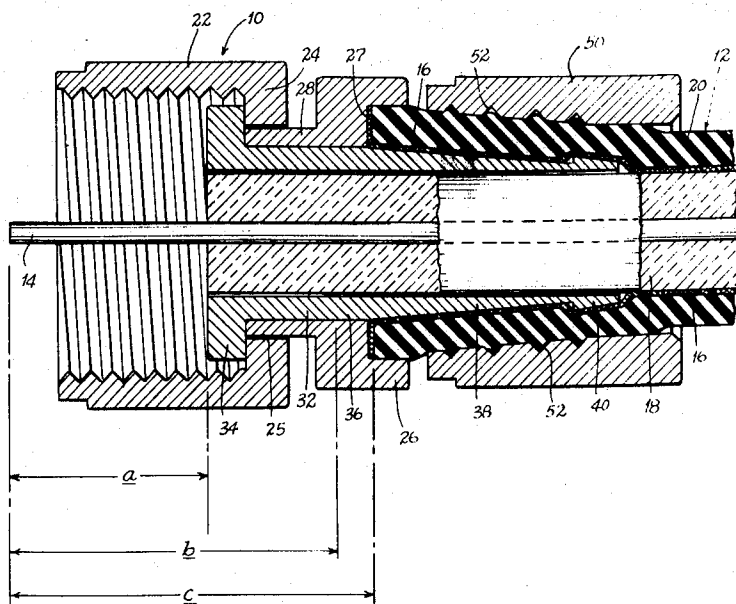
This invention relates to a connector for terminating the end of a cable, the cable including a center conductor, a coaxial shield separated from the center conductor by dielectric material, and an outer insulating jacket covering the shield. The connector includes a mandrel having a shank portion extending between the dielectric material and the shield, a connection means in electrical engagement with the mandrel, and means for holding the shank portion of the mandrel between the shield and dielectric material.

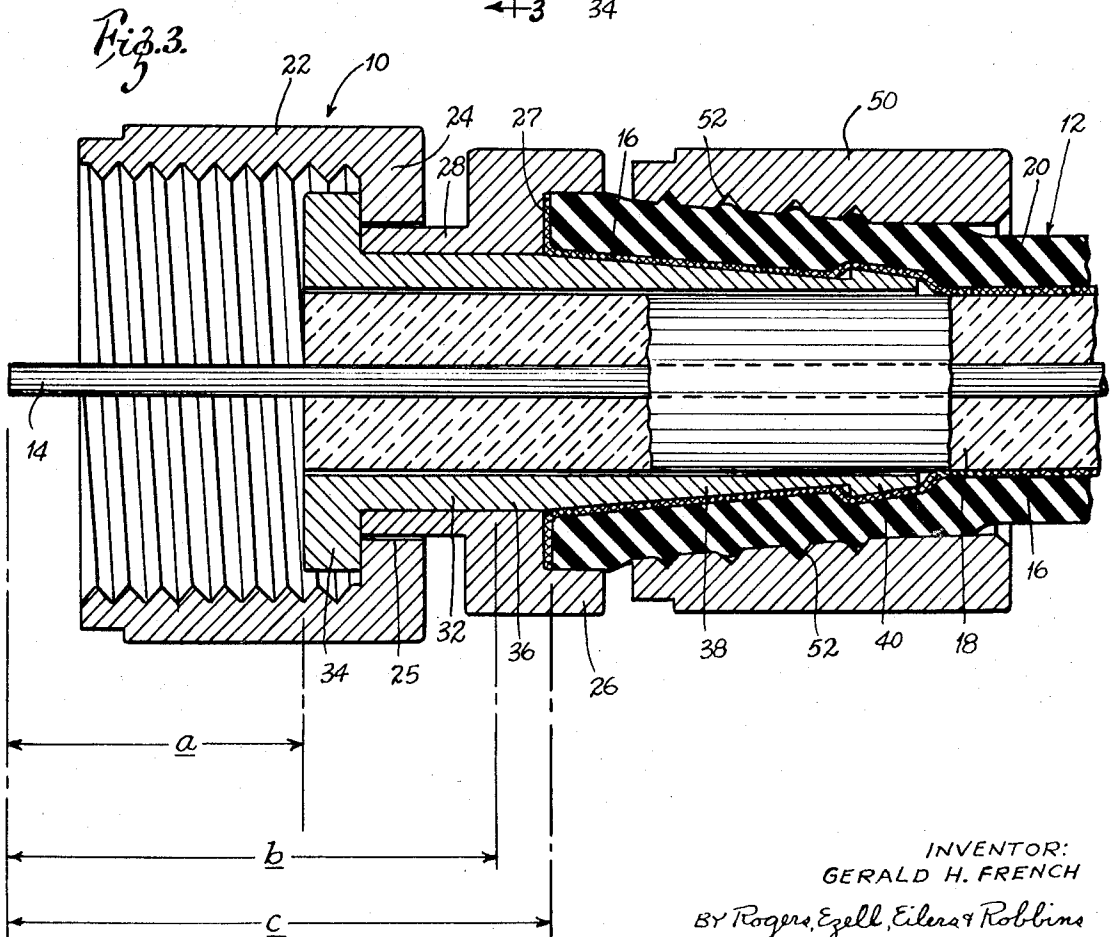
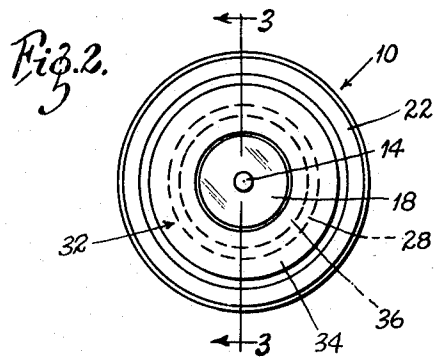
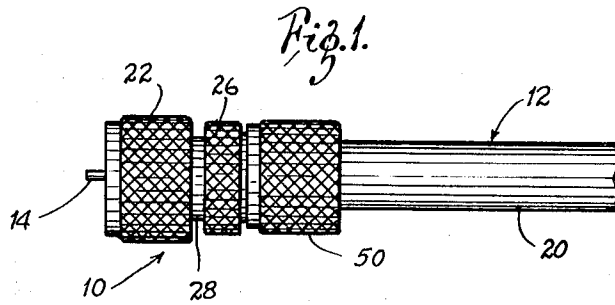
**3 Claims, 3 Drawing Figures**

[56] **References Cited**

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## ELECTRICAL CONNECTOR

## BACKGROUND OF THE INVENTION

Coaxial connectors are made in a wide variety of forms to accommodate a wide variety of coaxial cables and design requirements, but most generally include some type of connecting nut for electrical and mechanical engagement with a mating connector, a sleeve which extends along side the shield of the cable to make electrical contact therewith, the sleeve also making electrical contact with the connecting nut, and some means for holding the sleeve in firm contact with the shield to provide a strong mechanical connection between the connector and cable.

In some prior art connectors this holding means generally takes the form of a crimping ring positioned around the outer jacket of the cable where the sleeve engages the shield. The ring is crimped usually on one side only or at 180° intervals, using a special tool, to tighten the jacket and shield against the sleeve. The crimping produces unattractive barbs, and frequently causes the ring to split.

This invention eliminates the need for the crimped ring and, therefore, special tools for installing the connector, and greatly enhances the appearance of the connector.

## SUMMARY OF THE INVENTION

The novel coaxial connector of this invention includes a mandrel having a shank portion extending along the shield of the coaxial cable to be terminated. A connection means such as a connecting nut, is electrically and mechanically engaged with the mandrel by suitable means. A locking sleeve, having internal threads for engaging the outer surface of the outer jacket of the cable around the shank portion of the mandrel, holds the shield firmly against the mandrel.

The use of the internally threaded locking sleeve eliminates the need for a crimping ring or other similar holding device as well as the need for special crimping tools, and provides an easy and effective means for holding the connectors to the end of the coaxial cable. Furthermore, because the external surface of the locking sleeve can be made to take various shapes and forms, the attractiveness of the connector is greatly enhanced.

## DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of the connector of this invention;

FIG. 2 is an enlarged left end elevational view of the connector of FIG. 1; and

FIG. 3 is a further enlarged view in section taken along the line 3—3 of FIG. 2.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

In the drawing there is shown one embodiment of the connector 10 of this invention for use in terminating a length of coaxial cable 12. The coaxial cable 12 is of a type commonly known in the art, having a center conductor 14 surrounded coaxially by a shield 16 and separated from the shield by suitable coaxial dielectric material 18. An outer jacket 20 of suitable insulating material surrounds the shield 16. This invention is

described for use with but one type of cable, although, of course, it is suitable with other types, such as those having double shields, triaxial cables, and so on.

The connector 10 includes an internally threaded connector nut 22 having a shoulder 24 forming an aperture 25 smaller in diameter than the inside diameter of the threaded portion of the connector nut, but larger than the outside diameter of the dielectric material 18.

A keeper ring 26 has a recess 27 facing away from the connector nut 22 to receive the end of the outer jacket 20 of the cable 12 as hereinafter described, and a neck portion 28 which fits inside the aperture 25, so as to allow the connector nut 22 to turn freely with respect thereto. The inside diameter of the keeper ring 26 is larger than the outside diameter of the dielectric material 18 to allow space for a mandrel 32.

The mandrel 32 has a shoulder 34 at its forward end, a cylindrical portion 36 next to the shoulder 34, and a tapered shank 38 extending rearwardly from the cylindrical portion 36. The cylindrical portion 36 is press-fitted inside the keeper ring 26 with the shoulder 34 resting against the shoulder 24 of the connector nut 22. The inside diameter of the mandrel 32 is just slightly larger than the outside diameter of the dielectric material 18 so that the mandrel can be slid easily over the dielectric material with its tapered portion extending rearwardly between the dielectric material 18 and the shield 16. The tapered end of the mandrel 32 is formed with a small tapered shoulder 40 which tends to keep the mandrel from sliding out from between the dielectric material and the shield.

A locking sleeve 50 has internal threads 52 extending part way from its forward end. The threads 52 are relatively coarse, or wide pitched, to facilitate engagement with the outer surface of the jacket 20 and ease of assembly. As shown in the drawing, the jacket 20 actually protrudes into the threads 52, effectively creating threads in the jacket 20. Also, as shown in the drawing, the threads 52 stop at a point approximately opposite the shoulder 40 with the result that the unthreaded portion of the sleeve 50 applies greater pressure directly opposite the shoulder 40 than it otherwise would to increase holding strength.

The inside diameter of the locking sleeve 50 is slightly smaller than the outside diameter of the cable 12 where the mandrel lies between the dielectric 18 and shield 16, but is otherwise larger than the cable 12, so that the threads 52 engage the outer surface of the cable 12 as the locking sleeve is screwed forward along the tapered portion of the mandrel.

The round external surfaces of the connector nut 22 and sleeve 50 are preferably knurled to facilitate connection and installation.

## INSTALLATION

To install the connector of this invention to the end of a coaxial cable, the end of the cable must be prepared as shown in the drawing with the dielectric material 18 cut back a distance  $a$ , the shield 16 cut back a distance  $b$ , and the jacket 20 cut back a distance  $c$ , from the end of the cable. The shield 16 is cut slightly longer than the jacket 20 so that the end of the shield can be rolled back over the end of the jacket making insertion of the mandrel easier. The locking sleeve 50 is

slipped over and past the end of the cable with its threaded portion 52 facing forward. The locking sleeve 50 is moved far enough back on the cable so as not to interfere with the positioning of the mandrel 32.

The connector nut 22, keeper ring 26 and mandrel 32 are pre-assembled at the factory as shown in the drawing, with the inside diameter of the keeper ring 26 and the outside diameter of the cylindrical portion 36 of the mandrel 32 forming a press-fit therebetween. The inside diameter of the aperture 25 and outside diameter of the neck portion 28 are such that the connector nut 22 is free to turn with respect to the rest of the connector, allowing connection to a mating plug without turning the entire cable.

With the tapered shank 38 of the mandrel 32 extending rearwardly from the keeper ring 26, the shank 38 is inserted between the dielectric material 18 and shield 16 until the rolled end of the shield 16 is positioned in the recess 27; the shank 38 causing the outside diameter of the cable to enlarge next to the connector. With the connector nut 22, keeper ring 26, and mandrel 32 in place, the locking sleeve 50 is screwed onto the outer jacket 20 with its threads 52 engaging the outer surface of the jacket 20 as it is turned along the tapered shank 38.

With the locking sleeve 50 in the approximate position shown in the drawing, the shield 16 and jacket 20 are squeezed between the locking sleeve 50 and the mandrel 32 causing the shield and jacket to take the form shown in the drawing. Thus formed, the tapered shoulder 40 and locking sleeve 50 hold the connector firmly in position, all without the use of special crimping tools. When connection is made to a mating plug, the plug presses against the face of the shoulder 34 producing electrical and mechanical contact between opposing faces of the shoulders 24 and 34.

While the connector of the described embodiment of the invention is of a threaded, straight, female type for terminating the free end of a coaxial cable, certainly this invention also can be used with bulkhead and elbow type connectors, whether male or female, threaded, bayonet, or plug-in types. Also, while the outer surfaces of the connecting nut 22 and locking

sleeve 50 are described as round and knurled, it is to be understood that other suitable means could be used for facilitating connection and installation of the connector. For example, these surfaces could be hexagon shaped.

Various changes and modifications may be made within this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A connector terminating the end of a coaxial cable, said cable including a center conductor, a coaxial shield separated from the center conductor by dielectric material and an outer expandable insulating jacket covering the shield; the connector comprising a tubular electrically conductive mandrel having a shank portion extending coaxially inside the shield between the shield and the dielectric and in electrical contact with the shield displacing parts of the shield and jacket outwardly; an electrically conductive connection means for joining the cable to a complementary conductor, means electrically engaging and mechanically joining the connection means with the mandrel, and a locking sleeve of a size larger than the outer dimensions of the shank of the mandrel, and which fits over the cable outside the jacket, the sleeve being separate from the connection means and axially movable with respect to the mandrel, and having internal threads engaging the outer surfaces of the jacket around the shank portion of the mandrel, the threads engaging the jacket and pressing the shield and jacket between the mandrel and locking sleeve, thereby holding the shield in electrical and mechanical contact with the mandrel.

2. The connector of claim 1, wherein the mandrel is externally tapered and displaces the shield and jacket outwardly in a tapering manner, and the locking sleeve being threaded on the tapering part of the jacket to progressively increase the compressive forces thereon.

3. The connector of claim 1 wherein the mandrel has a shoulder around it beneath the locking sleeve resisting withdrawal of the mandrel from the sleeve.

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