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[54] CONNECTOR ELEMENT AND METHOD FOR ELEMENT ASSEMBLY

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[51] **Int. Cl.**.....**H01r 13/54**, H01r 17/04

[58] **Field of Search**.....29/511, 443, 629, 630 A; 285/382, 386; 339/177, 89, 90

[56] **References Cited**

UNITED STATES PATENTS

1,241,654	10/1917	Osgood	285/382
2,615,953	10/1952	Waite	339/89 C

FOREIGN PATENTS OR APPLICATIONS

1,177,220	1/1970	Great Britain	339/177 R

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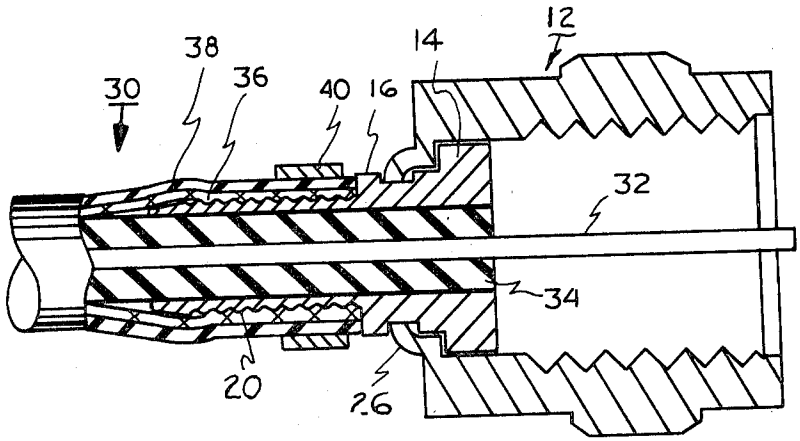
[57] **ABSTRACT**

A connector element and method for its assembly. A ferrule body having an enlarged forward section, a center section of reduced diameter having a circumferential groove formed in it, and an elongated rear section has a coupling nut mounted for rotation on it. The nut has an opening formed in its rear of diameter greater than that of the center section but less than that of the forward section in which the center section of the body is partially positioned. The coupling nut also has a circumferential ridge extending from the opening to the rear of the nut, which ridge is bent over by a suitable tool into the groove to lock the body and nut against lateral movement.

8 Claims, 2 Drawing Figures



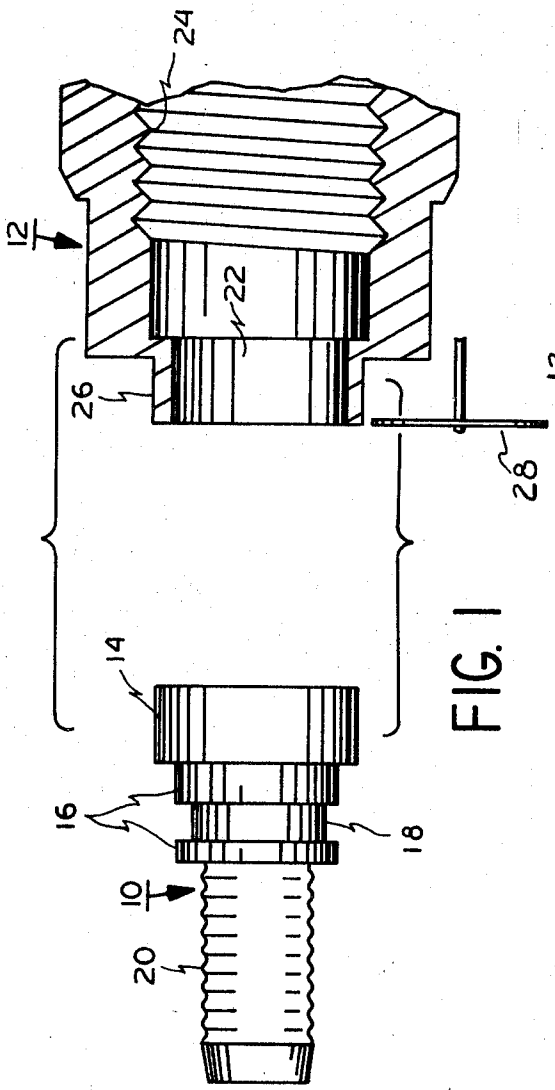


FIG. 1

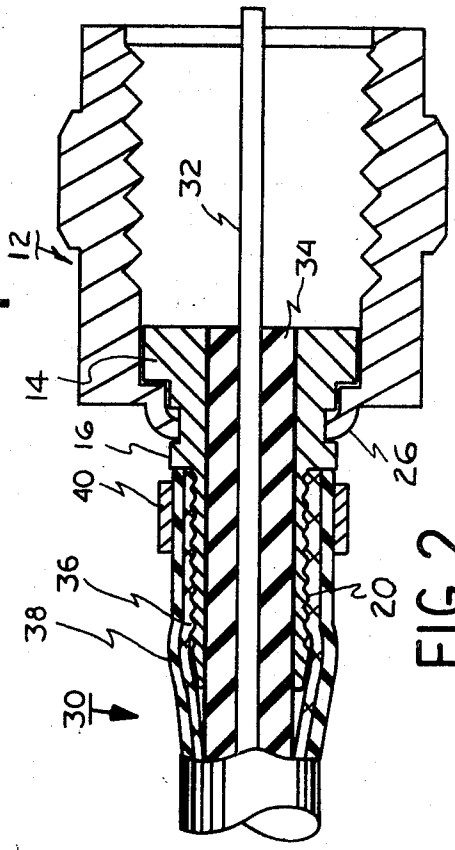


FIG. 2

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CONNECTOR ELEMENT AND METHOD FOR ELEMENT ASSEMBLY

This invention relates to a connector element having a ferrule body with a coupling nut mounted for rotation on the body and more particularly to a simple and inexpensive method and apparatus for captivating the nut on the body.

The elements of many electrical connectors, such as for example those utilized for connecting coaxial cables, have a body ferrule with a coupling nut mounted for rotation thereon. Additional contact and insulating elements may be fitted within the body and nut. Schemes utilized in the past for captivating the coupling nut on the body while permitting relative rotation between the elements have generally involved the use of a retaining ring or of some other additional elements and have thus been relatively complicated and expensive both in terms of material and assembly labor. Where plating is required, the extra parts also increase the cost of this operation. These connectors have also been relatively large and bulky and thus not ideally suited for miniature and subminiature applications, and the extra elements have increased the weight of the connector thus increasing shipping and other costs.

It is therefore a primary object of this invention to provide an improved scheme for captivating a coupling nut on the ferrule body of a connector element.

A more specific object of this invention is to provide a scheme of the type indicated above which results in a connector element which is easier to fabricate and less expensive both in terms of material and labor.

Another object of this invention is to provide a connector element of the type indicated above which is smaller, lighter, and less bulky than existing elements.

A still more specific object of this invention is to provide a scheme for reducing the number of components required to captivate a coupling nut on the body of a connector element.

In accordance with these objects this invention provides a connector element which includes a ferrule body and a coupling nut. The ferrule body has an enlarged forward section, a center section of reduced diameter having a circumferential groove formed therein, and an elongated rear section of further reduced diameter. The coupling nut has an opening at its rear of diameter greater than that of the center section but less than that of the body is partially positioned. The coupling nut also has a circumferential ridge extending from the opening to the rear of the nut which ridge is bent over by a suitable tool into the groove to lock the body and nut against latteral movement while permitting relative rotation between them.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a partially cutaway view of a connector in accordance with the teachings of this invention showing the elements in an unassembled condition.

FIG. 2 is a partially cutaway side view of the connector show in FIG. 1 in an assembled condition.

Referring now to the figures, it is seen that the connector of a preferred embodiment of the invention consists of two major elements, a ferrule body **10** and a coupling unit **12**. The ferrule body consists of an enlarged forward section **14** a center section **16** having a circumferential groove **18** formed in it and an elongated rear section **20** of further reduced diameter. Section **20** is tapered at its end and has grooves formed around it for reasons which will be described shortly. Coupling nut **12** has an opening **22** formed in its rear wall which opening is slightly greater in diameter than center section **16** of the ferrule body, but less in diameter than forward section **14**. The inner walls of coupling nut **12** are screw threaded at **24** for engagement with an externally threaded mating member. A ridge **26** extends from the rear of the coupling nut. The inner diameter of the ridge is the same as that of opening **22** and its outer diameter is roughly 0.03 inches greater. The thickness of this ridge will involve a trade-off between the strength of joint which is required and the thickness of ridge which can be tolerated before cracking occurs on the bending-over operation. The length of ridge **26** is roughly equal to the depth of groove **18**, the length of the ridge being slightly greater than the depth of the groove to permit for rollover in the preferred embodiment of the invention shown in the drawings. While the depth of penetration of ridge **26** into groove **18** is not critical, the deeper the penetration the stronger the joint. However, if the ridge is so long as to bear against the base of groove **18**, then relative rotation of the elements may be inhibited.

In assembling the connector, the ferrule body, starting with rear section **20**, is passed through the inside of coupling nut **12** and through opening **22**. When the ferrule body has been passed through hole **22** to a position with enlarged section **14** of the body butting against the rear wall of nut **12** and the forward portion of center section **16**, the portion of the center section ahead of groove **18**, positioned in opening **22**, (the position shown in FIG. **2**) a tool may be applied to bend ridge **26** over into groove **18** to complete the coupling operation. The tool utilized would preferably be a rotating wheel **28** which is slowly pressed against ridge **26** to bend it over into the groove. A suitable mechanism is also provided for rotating the connector elements relative to the wheel to permit the ridge to be bent around its entire periphery. This would generally be accomplished by mounting the connector elements in a rotating chuck.

FIG. **2** shows by way of illustration, a coaxial cable **30** having an inner conductor **32**, and insulator **34**, and outer conductive braid **36**, and a protective cover **38** positioned on ferrule body **10**. The rear section **20** of the ferrule body passes between the insulator and the conductive braid and is secured to the cable by a standard crimp ferrule **40**. The grooves on section **20** assist in gripping the cable. A standard insulating block, and inner and outer contact members (not shown) may be positioned in coupling nut **12** to complete the connector assembly.

A connector assembly has thus been provided in which no additional parts are required in order to secure the ferrule body and coupling nut together. The assembly operation, as described, is thus relatively simple and inexpensive and, due to the lack of extra parts, the resulting connector is smaller, lighter, less bulk and less expensive than existing connectors. Further, by controlling the thickness of ridge **26**, the connection between the major elements of the connector may, with certain limitations, be made as strong as desired.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A connector element comprising:
   - a ferrule body having an enlarged forward section, a center section of reduced diameter, said center section having a circumferential groove formed in it, and an elongated rear section of further reduced diameter; and
   - a coupling nut having an opening at its rear of diameter greater than said center section but less than said forward section in which opening said center section is partially positioned, and a circumferential ridge extending from said opening to the rear of said nut and bent over into said groove to lock said body and nut against latteral movement while permitting relative rotation between them.

2. A connector of the type described in claim **1** wherein the inner diameter of said ridge is the same as the diameter of said openings.

3. A connector of the type described in claim **1** wherein the thickness of said ridge is in the order of several hundredths of an inch.

4. A connector of the type described in claim **1** wherein the length of said ridge is substantially equal to the depth of said groove.

5. A connector of the type described in claim 1 wherein the portion of said center section positioned in said opening is the portion of said section ahead of said groove.

6. A connector of the type described in claim 1 wherein said rear section is adapted to be fitted between the insulator and the outer conductor of a coaxial cable;

and including a crimp ferrule positioned over said rear section and adapted to secure said cable to said body.

7. A method of assembling a connector element having a ferrule body and a coupling nut, the body having an enlarged forward section, a center section of reduced diameter having a circumferential groove formed in it, and an elongated rear section of further reduced diameter, and said coupling nut having an opening in its rear of diameter slightly greater than

said center section but less than said forward section with a circumferential ridge extending from said opening to the rear of said nut, comprising the steps of:

passing the rear and center sections of said body through said opening and ridge until the enlarged forward section of said body butts against the rear of said nut; and

applying a suitable tool to said ridge to bend it over into said groove to lock said body and nut against latteral movement while permitting relative rotation between them.

8. A method of the type described in claim 7 wherein said tool is a rotating wheel adapted to slowly bear against said ridge to bend it into said groove.

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