United States Patent [19]

Spinner

[11] **3,907,399**

[45] **Sept. 23, 1975**

[54] **HF COAXIAL PLUG CONNECTOR**

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[22] Filed: **Dec. 12, 1973**

[21] Appl. No.: **423,908**

[30] **Foreign Application Priority Data**

Dec. 12, 1972 Germany 2260734

[52] **U.S. Cl.** ..... **339/177 R;** 174/89

[51] **Int. Cl.²** **H01R 17/18**

[58] **Field of Search** ..... 339/177 R, 177 E; 174/75 C, 88 C, 89

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[57] **ABSTRACT**

The specification describes a HF coaxial plug connector with a clamping ring, on whose end face the external cable conduction is crimped and which with an axial clamping action presses the crimped-over end of the external conductor against an end contact annular surface of the plug connector for the purpose of making electrical contact. A nut acts on an intermediate ring which presses the clamping ring toward the connector.

8 Claims, 2 Drawing Figures

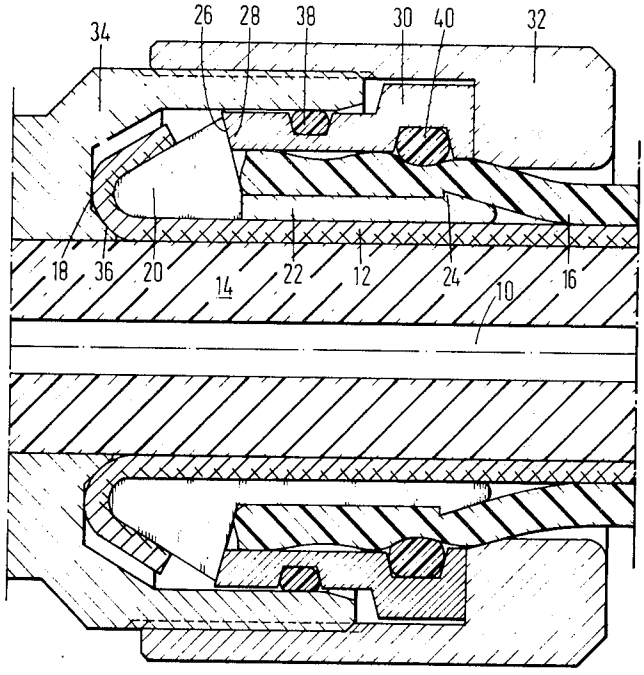


Fig. 1

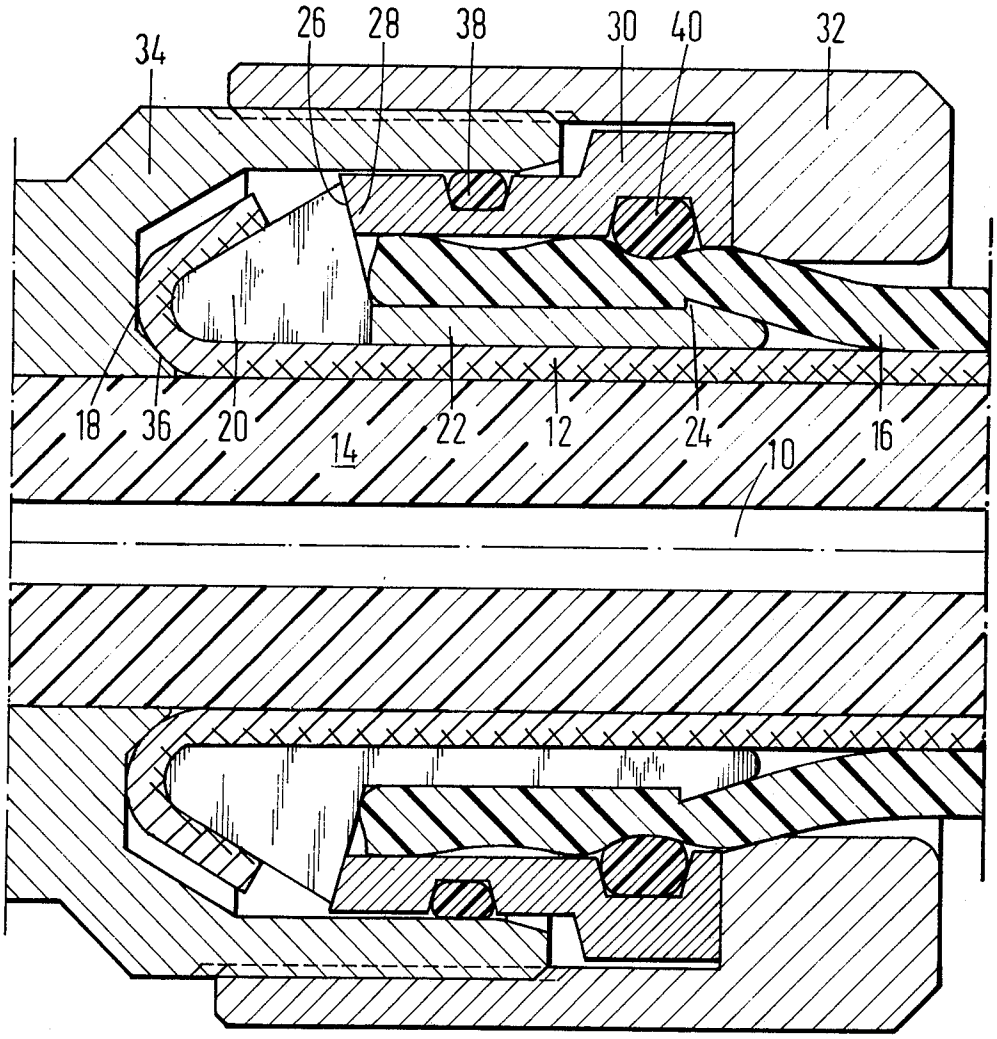
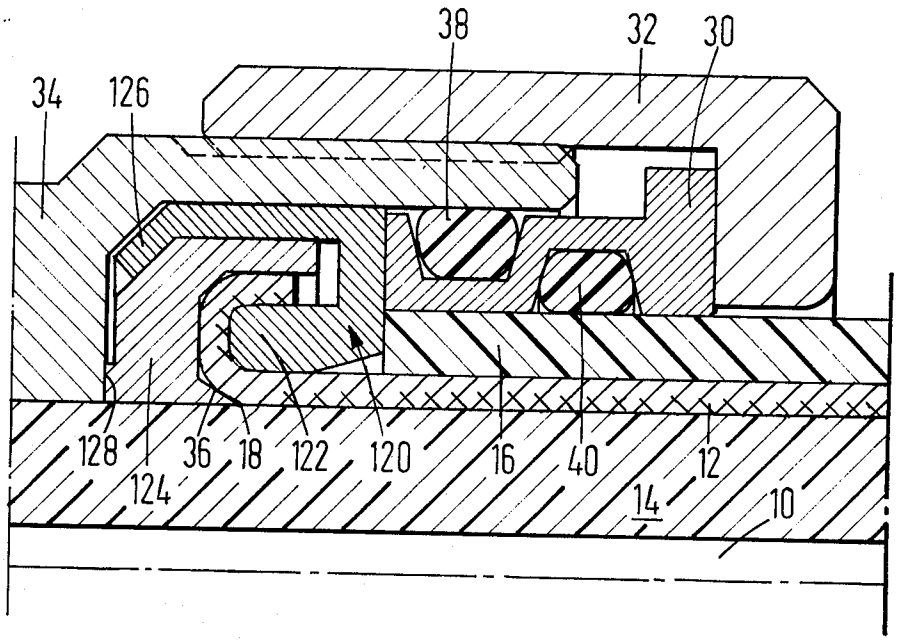


Fig. 2



HF COAXIAL PLUG CONNECTOR

BACKGROUND OF INVENTION

1. Field to which invention relates

The invention relates to a HF coaxial plug connector with a clamping ring, on whose end face the external cable conductor is crimped and which with an axial clamping action presses the crimped over end of the external conductor against an end contact annular surface of the plug connector for the purpose of making electrical contact.

2. The prior art

In the case of prior art plug connector and connecting fittings respectively of this construction the axial clamping action is brought about via a sealing ring consisting of elastic material, which in the case of axial clamping is pressed owing to the incompressibility of the material with a radial sealing pressure against the plug connector head and the external cable casing. This leads to a very simple construction which is satisfactory as regards electrical contacting and sealing, and which has proven successful on a large scale.

Difficulties may occur if the external cable conductor is surrounded by a plastic material consisting for example of PVC, which inclines to flow. If such a plastic casing is caused by the influence of the radial sealing pressure, which is exerted by the elastic sealing ring, to yield after a certain time to this pressure and "flows" there is a reduction in a corresponding manner of the axial pressure exerted on the clamping ring and there is therefore also a reduction in the contacting pressure between the crimped over end of the external cable conductor and the contact end face of the plug connector head.

SUMMARY OF INVENTION

One aim of the invention is to provide a universally applicable coaxial plug connector with a fixing action which ensures the necessary axial contact pressure reliably over long periods of time.

In accordance with one aspect the invention attains this aim in that the connecting force of the axial clamping is enclosed via rigid metallic ring bodies. This ensures that the clamping axial pressure, once it has been set, remains, because the sealing material no longer takes place in force transmission. The sealing action is carried out in accordance with a preferred embodiment of the invention via one or more sealing rings, which are placed in external or, respectively, internal peripheral grooves of a pressure transmitting sleeve, which transmits the axial clamping pressure from a nut with an internal shoulder to the clamping ring.

There has also been a prior proposal to provide a slit or slot in the clamping ring in order to make possible a closing of this clamping ring with a concomitant reduction in diameter so that accordingly the clamping ring is pressed with a radial pressure on the external cable conductor. This is particularly convenient in the case of cables, whose external conductors are formed by a braided wire casing. In the case of previously proposed cable plug connectors with a slit clamping ring the latter is pressed together by the radial sealing pressure force of the axially clamped sealing rings. If for the above-mentioned reasons the axial clamping force decreases there will be a concomitant, parallel decrease in the force which radially presses the clamping ring against the external conductor. In order to avoid this,

there is the provision in accordance with a further form of the invention that the pressure annular faces of the clamping ring and the pressure transmitting sleeve are to be so conically constructed that in the case of axial clamping via the conical pressing faces the clamping ring is drawn together and pressed radially inwards. Owing to suitable dimensioning of the cone or apex cone angle it is possible to prevent the inclusion of air between the external cable conductor and the cable dielectric. This type of radial clamping is particularly important owing to the flexibility of the braided metal casing in the case of cables, which are provided with a braided external conductor. The invention can, however, also be employed with plug connectors which are to be fixed on a cable with a smooth casing or a corrugated casing.

The invention makes it possible to achieve a permanently gas-and water-tight connection.

The clamping ring is provided in accordance with one form of the invention with a sleeve shoulder, which can be inserted by sliding between the external cable conductor and the plastic protective casing and is hooked in the latter by means of a collar-like retaining hook. The radial pressure on the external plastic casing at this position is brought about by means of a seal, which is mounted in an internal groove of the pressure transmitting sleeve.

In accordance with another embodiment of the invention, which can more particularly be used in those cases when it is important to ensure a short constructional length of the plug connector or of the plug connector fixing means, the clamping ring is constructed in a C-shaped manner, and the outer cable conductor end is crimped onto the end of the one limb and is supported via an intermediate ring having an L-shaped cross-section on the end contact annular surface of the plug connector head.

LIST OF SEVERAL VIEWS OF DRAWINGS

In what follows embodiments of the invention will be described with reference to the drawings.

FIG. 1 shows a sectional view of a coaxial plug connector fixed on a coaxial cable with a braided external conductor.

FIG. 2 shows a sectional view of a plug connector with a modified construction of the clamping ring for reducing the overall constructional length.

DESCRIPTION OF PREFERRED EMBODIMENTS

In accordance with the embodiments of the invention shown the cable, on which the plug connector is to be mounted, has an internal cable conductor **10**, an external cable conductor **12** in the form of braided material, a cable dielectric **14** between the internal and external conductors and a plastic casing **16** surrounding the external conductor **12**. The front end **18** of the external cable conductor is laid around the front end of a clamping ring **20**, which has a through slot or slit (see the lower half of the sectional view in accordance with FIG. 1) and a recess which is offset by **180°**. The clamping ring, which is preferably constructed in accordance with the principles of the German Pat. No. **1,440,186**, has a sleeve extension **22** inserted between the external cable conductor **12** and the plastic casing **16**. Its end has a collar **24** constructed in the manner of a retaining hook, buried in the plastic casing **16**. The clamping ring **20** possesses a conical surface **26** which rests against a

correspondingly conically shaped annular surface **28** of a pressure transmitting ring **30,** which in the rear part rests axially against a nut **32** with an internal shoulder. This nut is screwed on an external thread of the plug connector head **34.** The conical or apex angle of the surfaces **26, 28** is so selected that the clamping ring **20** is firstly closed and then radially pressed against the external cable conductor **12** and presses the latter against the cable dielectric while avoiding the trapping of air. The end annular surface, making contact with the turnedover end **18** of the external conductor, of the plug connector head **34** has a conical shoulder **36** which is so shaped that the annular gap produced by the rounding of the crimped-over part, between the rounded crimped part of the external conductor and the cable dielectric is substantially filled out.

The pressure transmitting ring **30** has a surrounding external groove with an inserted sealing ring **38,** which brings about a sealing contact with the plug connector head **34.** An internal groove lying further to the rear of the pressure transmitting ring accepts a sealing ring **40,** which produces a sealing pressure against the cable protective casing **16.** This ring **40** lies behind the tooth-like edge **24** on the outside so that a water-tight sealing action is ensured.

The embodiment of the invention in accordance with FIG. **2** differs from the embodiment in accordance with FIG. **1** in essence with respect to the construction of the clamping ring. In order to shorten the overall constructional length, the clamping ring **120** in accordance with FIG. **2** has a generally C-shaped form; over the one limb end **122** the end **18** of the external conductor **12** is crimped. In this case the plug connector head does not rest directly against this crimped-over part **18** and instead an intermediate ring **124** rests against it. The conical front end of this ring **124** has the other limb **126** of the pressing ring **120,** which is C-shaped in cross-section, crimped onto it. This intermediate ring **124** has one contact surface **128** resting against the end contact annular surface of the plug connector head **34.**

In accordance with a further development of the invention, which is not shown in the drawing, plate springs or Belville washers could be arranged between the nut **32** with an internal shoulder and the pressure transmission ring **30** in order to provide for a predetermined biasing in an axial direction. This biasing action would be permanently maintained. A certain axial clamping action can be obtained simply by the pressure transmitting ring, because the latter has a meandering cross-sectional shape which ensures satisfactory elasticity in the longitudinal direction.

I claim:

1. An HF coaxial conductor clamping assembly comprising:

a coaxial cable with an internal conductor, an external conductor surrounding said internal conductor and a dielectric layer therebetween;

a clamping ring extending annularly around said external conductor and having an end with an end face over which said external conductor is crimped;

an annular plug connector positioned in opposed relationship to said clamping ring end; said plug connector having an end contact annular surface positioned such that said clamping ring end face clamps said external conductor against said annular surface for making electric contact;

a nut having a shoulder facing toward said plug connector annular surface; said clamping ring being between said nut shoulder and said end contact annular surface and said shoulder being spaced from said clamping ring; means on said nut for screwing it onto said plug connector and for tightening said nut toward said plug connector end contact annular surface;

a pressure transmitting sleeve extending annularly around said external conductor and interposed between said clamping ring and said nut shoulder, such that tightening of said nut presses said sleeve against said clamping ring to clamp said external conductor;

said sleeve and said clamping ring having cooperating, engaging and matingly tapered annular surfaces that are angled to force said clamping ring radially inwardly against said external conductor.

2. The assembly of claim **1,** further comprising:

said plug connector end annular surface having a radially inner end adjacent to said external conductor and which is conically shaped to define a second shoulder; said external conductor crimped part and said clamping ring end face are rounded, thereby to cooperatively engage said second shoulder.

3. The assembly of claim **2,** wherein said clamping ring has a sleeve part extending along said cable and toward said nut; an insulating layer located outside of and extending around said external conductor; said sleeve part of said clamping ring extending between said insulating layer and said external conductor.

4. The assembly of claim **3,** wherein said pressure transmitting sleeve has an interior side facing toward said insulating layer; said pressure transmitting sleeve interior side having an interior annular groove formed therein; an interior sealing ring in said interior annular groove for sealing said pressure transmitting sleeve against said insulating layer;

said sleeve part having an exterior surface with a radially outwardly projecting collar thereon, and that said collar is so positioned as to engage said insulating layer at the side of said interior sealing ring that is closer to said nut.

5. The assembly of claim **1,** wherein said pressure transmitting sleeve has an interior side facing toward said cable; said pressure transmitting sleeve interior side having an interior annular groove formed therein; an interior sealing ring in said interior annular groove for sealing said pressure transmitting sleeve against said cable.

6. The assembly of claim **5,** wherein said pressure transmitting sleeve has an exterior side and in said pressure transmitting sleeve exterior side is formed an exterior annular groove; an exterior sealing ring in said exterior annular groove for sealing said pressure transmitting sleeve against said plug connector.

7. An HF coaxial conductor clamping assembly comprising:

a coaxial cable with an internal conductor, an external conductor surrounding said internal conductor and a dielectric layer therebetween;

a clamping ring extending annularly around said external conductor and having an end with an end face over which said external conductor is crimped;

an annular plug connector positioned in opposed relationship to said clamping ring end; said plug con-

nector having an end contact annular surface positioned such that said clamping ring end face clamps said external conductor against said annular surface for making electric contact;

a nut having a shoulder facing toward said plug connector annular surface; said clamping ring being between said nut shoulder and said end contact annular surface and said shoulder being spaced from said clamping ring; means on said nut for screwing it onto said plug connector and for tightening said nut toward said plug connector end contact annular surface;

a pressure transmitting sleeve extending annularly around said external conductor and interposed between said clamping ring and said nut shoulder, such that tightening of said nut presses said sleeve against said clamping ring to clamp said external conductor;

said sleeve and said clamping ring having cooperating, engaging and annular surfaces;

said clamping ring extending annularly around said external conductor and also wraps around that end of said external conductor where it is crimped over said clamping ring; said clamping ring being curvedly shaped to extend away from said nut and toward said plug connector such that said clamping ring has a C-shaped cross-section, with the end of said external conductor extending into the curve of said C-shape;

an intermediate ring, annularly extending around said external conductor and having an L-shaped cross-section, with one leg of the L extending into the curve of said C-shape; said intermediate ring one leg having one surface lying against the crimped over end of said external conductor and having an opposite surface to said one surface that lies against said clamping ring;

said intermediate ring also serving as part of said plug connector in that said plug connector end contact annular surface is part of said intermediate ring and said intermediate ring L-shape having another leg on which that said surface is included.

8. The assembly of claim **7**, wherein said intermediate ring L-shape has an inner side inside the L and an outer side outside the L; said clamping ring being crimped over said outer side of said intermediate ring and over the bend of the L-shape of that said ring, in order to connect said clamping ring and said intermediate ring together.

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