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(71) Applicant: **Dinh-Debouny, Huu-Tung**
4430 Ans (BE)

(72) Inventor: **Dinh-Debouny, Huu-Tung**
4430 Ans (BE)

(74) Representative: **Lerho, Marc J. A. et al**
Office Van Malderen
Bd de la Sauvenière 85/043
B-4000 Liège (BE)

(54) **Terminator locking device**

(57) The present invention is related to a safety co-axial termination or connection device, comprising :
- a safety member (1), flat, elongated and essentially transverse with respect to the connector axis, said safety member (1) comprising a chamber and an orifice (4) at one end, said orifice (4) being adapted to accommodate the external envelope of the connector through the safety member (1) and close to a base of the connector (5) ;
- a locking mechanism located inside the chamber, comprising a locking member (6) and a compression spring (7), so that, in the locked position, the locking member fits transversally with the truncated part (5', 5") of the connector external envelope ;
- a tool (9) adapted to be introduced into an opening (8) on one side of the safety member (1), said tool comprising a stem and terminated by a protrusion (10) transverse to the stem axis, so that the protrusion (10) is configured to push the locking member (6) away from the truncated part (5', 5") of the connector external envelope, against the spring compression force, to put the safety device in an unlocked position.

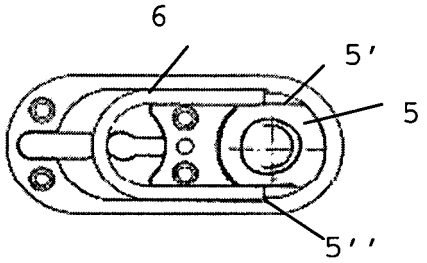

FIG.3

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Description

Field of the invention

[0001] The present invention is related to a coaxial electric connector, preferably a HF coaxial connector or a fibre optic connector with a coaxial envelope, provided with a locking device.

[0002] Particularly, the invention addresses a filter or a terminator provided with a locking device, intended to equip couplers or multi-taps in the field of community antenna or cable TV (CATV). The purpose of the filter or the terminator typically is to allow access to pay-TV programs only to those who are authorised therefor. The locking device's function is to prevent fraudulent removal of the filter. However the invention would find application in any field wherein it is desirable to prevent unauthorised separation of coaxial male and female connectors.

Background and prior art

[0003] Traditionally CATV coax networks comprise mother lines or trunks split by use of directional couplers, which generate coupled line extenders including at their turn a number of couplers or multi-taps providing the final signal distribution to individual subscribers. Frequently n-way multi-taps are installed outdoor at the front of buildings, with apparent output ports comprising female coaxial plugs for connection to drop lines bringing CATV signal to the effective subscribers. Some plugs may be access-forbidden or unused, especially when they service subscribers with specific pay programs. Desired corresponding access restriction is usually provided by screwing some terminators on unused output ports. Terminators have the double function of matching impedance of the signal-carrying coaxial cable and preventing trivial signal pirating by connecting a drop cable to any unused output port.

[0004] A number of such tamper-resistant locking devices are known (for example, see US-A-3,845,454, US-A-5,106,312, US-A-5,273,444, US-B-6,491,546, US-A-2005/0208883). These applications are based on the same principle : an internal cylindrical connector comprising a resistive load (e.g. 75 ohm) is encapsuled in a concentric external shield. In use, the shield rotates freely about the connector, owing to a retaining snap ring for example and it is impossible to remove the connector without a dedicated tool. The latter is generally designed to be introduced axially in the terminator for accessing the connector and screwing/unscrewing it. The coupling is obtained for example by friction or by engagement of a protrusion or a tooth in a slot.

[0005] In another system, the tool or key is a hollow cylinder comprising two teeth diametrically and inward located, able to engage corresponding diametrically located slots on the connector, at its base.

[0006] These devices suffer from a number of drawbacks :

- the terminators and the corresponding tools are complex and thus expensive to manufacture ;
- some of the keys are easy to counterfeit or become available commercially with time ;
- injecting strong glue permits to couple the connector and the shield and thus to unscrew the device ;
- authorised service operators are hindered when using bulky tools such as external concentric keys, especially when couplers are provided with many output ports, some of them possibly equipped with terminators ;
- keys provided with teeth are subject to fatigue and to breakage ;
- the retaining snap rings may be visible and are possibly removable.

[0007] At last some solutions include an external shield which is fixed to the connector using a lateral hexagonal bolt or screw. These solutions with a pressure screw are subject to wear with a consequence that the shield will finally turn about the connector.

Aims of the invention

[0008] The present invention aims to provide a solution preventing the drawbacks of prior art.

[0009] In particular the invention aims at proposing a terminator locking device associated with a tool having easier access to the device.

[0010] Moreover the invention is dedicated to make that a bulky device which obstruction by objects in the neighbourhood prevents any rotation of the connector.

[0011] Additionally the invention is intended to prevent facilitating device removal by injection of strong glue.

[0012] The invention aims also at providing a vertical access for the associated tool as well as at preventing the use of blocking screws which are visible or can be lost.

[0013] The invention aims also at providing an associated tool which is simple, not bulky and cheap.

Summary of the invention

[0014] The present invention is related to a safety coaxial termination or connection device, comprising :

- a connector having a first end, a second end and an essentially tubular external envelope, including interior threads disposed at said first end capable to fit with corresponding threads of a coupler output port, said envelope of the connector being truncated according to two parallel planes ;
- a safety member, flat, elongated and essentially transverse with respect to the connector axis, said safety member comprising a chamber and an orifice at one end, said orifice being adapted to accommodate the external envelope of the connector through the safety member and close to the base of the connector ;

- a locking mechanism located inside the chamber, comprising a locking member and a compression spring, so that, in a locked position, the locking member fits transversally with the truncated part of the connector external envelope ;
- a tool adapted to be introduced into an opening on one side of the safety member, said tool comprising a stem and terminated by a protrusion transverse to the stem axis, so that the protrusion is configured to push the locking member away from the truncated part of the connector external envelope, against the spring compression force, to put the safety device in an unlocked position.

[0015] According to the invention, the locking member has the form of a horseshoe, capable to move longitudinally in the chamber.

[0016] Advantageously, the ratio of the longest dimension of the safety member and the orifice diameter is greater than 3.

[0017] Still advantageously, the ratio of the longest dimension and the thickness of the safety member is greater than 10.

[0018] Preferably, the safety member is oval, said orifice being provided at a round periphery of the safety member.

[0019] Still preferably, an impedance charge is secured within the connector.

[0020] According to a preferred embodiment, the connector is a F-type male charge and the safety termination device is effective as a filter or an attenuator, the second end of the connector being provided with threads to fit a coaxial drop line.

[0021] Preferably, the connector and the safety member are composed of metal, preferably brass or stainless steel.

[0022] The invention is particularly intended to be used as a safety filter or terminator for equipping couplers or multi-taps in the field of CATV.

Short description of the drawings

[0023] FIG. 1A and 1B represent perspective views (exploded view in FIG.1B) of the terminator locking device pertaining to the present invention.

[0024] FIG. 2A to 2C represent respectively an upper plan view and cross-sectional views of the device depicted in FIG. 1A and 1B.

[0025] FIG.3 represents a lower plan view corresponding to the upper plan view of FIG.2A.

[0026] FIG.4 represents a perspective view of the safety member disposed on the connector, as well as the corresponding opening tool, according to a preferred embodiment of the present invention.

Description of a preferred embodiment of the invention

[0027] As shown in FIG.1A and FIG. 1B, the device according to the invention, contrary to most of prior art devices, is horizontally extended, not vertically extended. The property to exploit is that an essentially horizontal, relatively flat extension would render the system, when locked, extremely bulky, owing to the fact that, most of the time, there are several output ports on a same coupler. Thus the principle carried out by the invention is to prevent unscrewing of the connector, the bulky locking device attached to the latter co-operating with the other ports for making obstruction to unscrewing.

[0028] Another major difference with most of the prior art is that there is no shield concentric with the cylindrical connector and no relative free movement between these two parts in use, which is usually due to the presence of a retaining snap ring. In the present invention there is no snap ring and the locking device is firmly attached in use to the connector by means of a special key.

[0029] The locking device 1 according to the invention has an oval form and is made of two parts 2, 3 which fit together by means of tenons, thus making a void inside (see FIG.2B and FIG.2C). A bore 4 is provided at one end of the oval in order to match the connector (see FIG. 3). Matching with the locking device of the invention requires the use of specially machined cylindrical connectors 5, presenting two truncation parallel planes 5', 5".

[0030] The system is provided with a part 6 having the form of a horseshoe, which is normally pushed by a compression spring 7 into the voids left by the truncated connector in the round bore 4. To open the locking device once locked, an opening 8 is provided in one of the caps 2, 3 to introduce a tool or a key 9 vertically, provided with a stem having a transverse protrusion 10, and which is able to push back the part 6 against spring 7 and free the locking device 1 from the connector (see FIG.4).

[0031] The advantages of the present invention are the following :

- the key is not bulky, simple to manufacture and with easy access into the locking device ;
- the device can be used even if a very small place is left between output ports on the coupler ;
- fraud using strong glue is no more possible, because, in use, the locking device is actually fixed to the connector ;
- there is no visible screw or mechanism, which efficiently prevents understanding of the locking principle from outside.

Claims

1. Safety coaxial termination or connection device, comprising :

- a connector (5) having a first end, a second end and an essentially tubular external envelope, including interior threads disposed at said first end capable to fit with corresponding threads of a coupler output port, said envelope of the connector being truncated according to two parallel planes (5', 5") ;
- a safety member (1), flat, elongated and essentially transverse with respect to the connector axis, said safety member (1) comprising a chamber and an orifice (4) at one end, said orifice (4) being adapted to accommodate the external envelope of the connector through the safety member (1) and close to a base of the connector (5) ;
- a locking mechanism located inside the chamber, comprising a locking member (6) and a compression spring (7), so that, in a locked position, the locking member fits transversally with the truncated part (5', 5") of the connector external envelope ;
- a tool (9) adapted to be introduced into an opening (8) on one side of the safety member (1), said tool comprising a stem and terminated by a protrusion (10) transverse to the stem axis, so that the protrusion (10) is configured to push the locking member (6) away from the truncated part (5', 5") of the connector external envelope, against the spring compression force, to put the safety device in an unlocked position.

2. Safety device according to Claim 1, **characterised in that** the locking member (6) has the form of a horseshoe, capable to move longitudinally in the chamber.

3. Safety device according to Claim 1 or 2, **characterised in that** the ratio of the longest dimension of the safety member (1) and the orifice (8) diameter is greater than 3.

4. Safety device according to anyone of the preceding claims, **characterised in that** the ratio of the longest dimension and the thickness of the safety member (1) is greater than 10.

5. Safety device according to anyone of the preceding claims, **characterised in that** the safety member (1) is oval, said orifice (8) being provided at a round periphery of the safety member.

6. Safety device according to anyone of the preceding claims, **characterised in that** an impedance charge is secured within the connector (5).

7. Safety device according to Claim 6, **characterised in that** the connector is a F-type male charge.

8. Safety device according to anyone of the preceding claims, **characterised in that** the device is a filter or an attenuator, the second end of the connector (5) being provided with threads to fit a coaxial drop line.

9. Safety device according to anyone of the preceding claims, **characterised in that** the connector (5) and the safety member (1) are composed of metal, preferably brass or stainless steel.

10. Use of the safety device according to anyone of the preceding claims, as a filter or terminator for equipping couplers or multi-taps in the field of CATV.

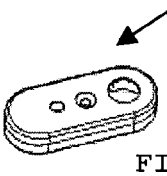


FIG.1A

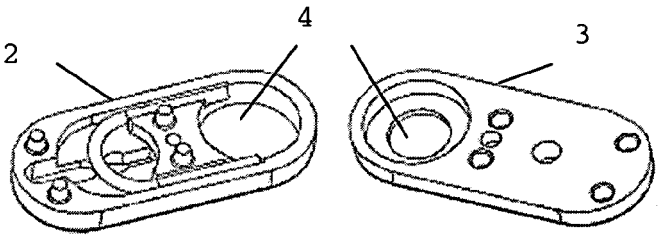


FIG.1B

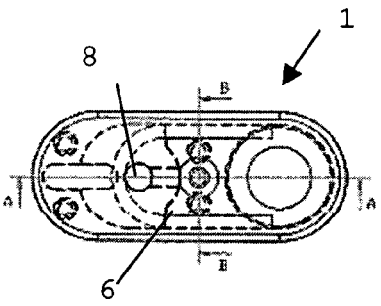


FIG.2A

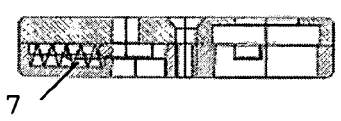


FIG.2B

BB axis

FIG.2C

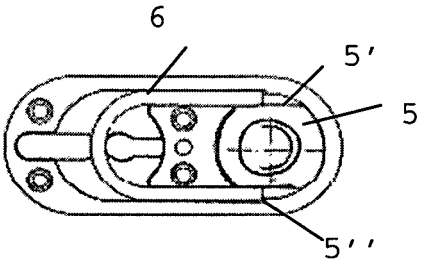
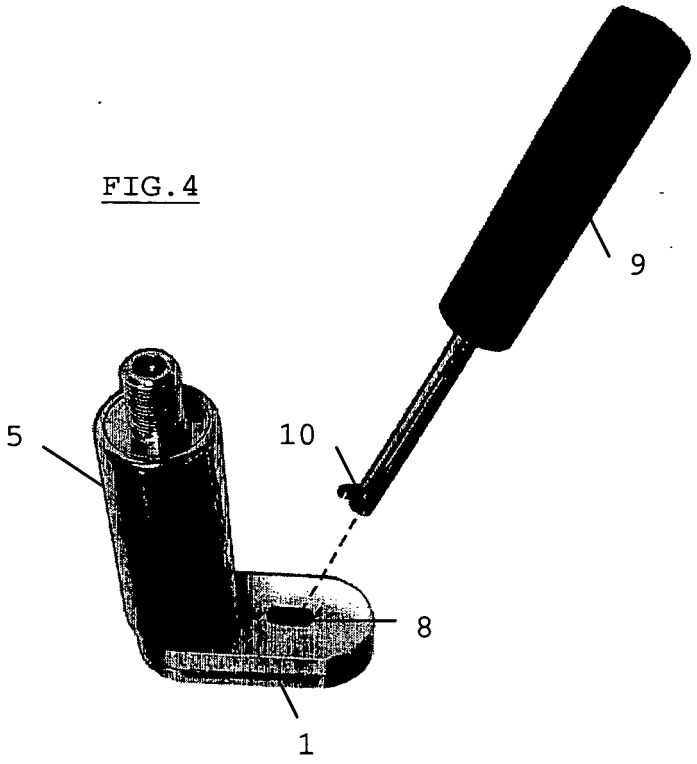


FIG.3

FIG.4



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EUROPEAN SEARCH REPORT

Application Number
EP 05 44 7248

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

H01R
F16B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 April 2006	Arenz, R

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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