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(54) Element for connecting a reticular shielding coaxial cable for taps, plugs and the like, and relevant method of manufacture

(57) The element (1) for connecting a reticular shielding coaxial cable (4') for taps, plugs and the like, between an input terminal (2) and an output terminal (3) thereof exhibits a coaxial transmission line (4) that develops in continuity with the coaxial cable (4').

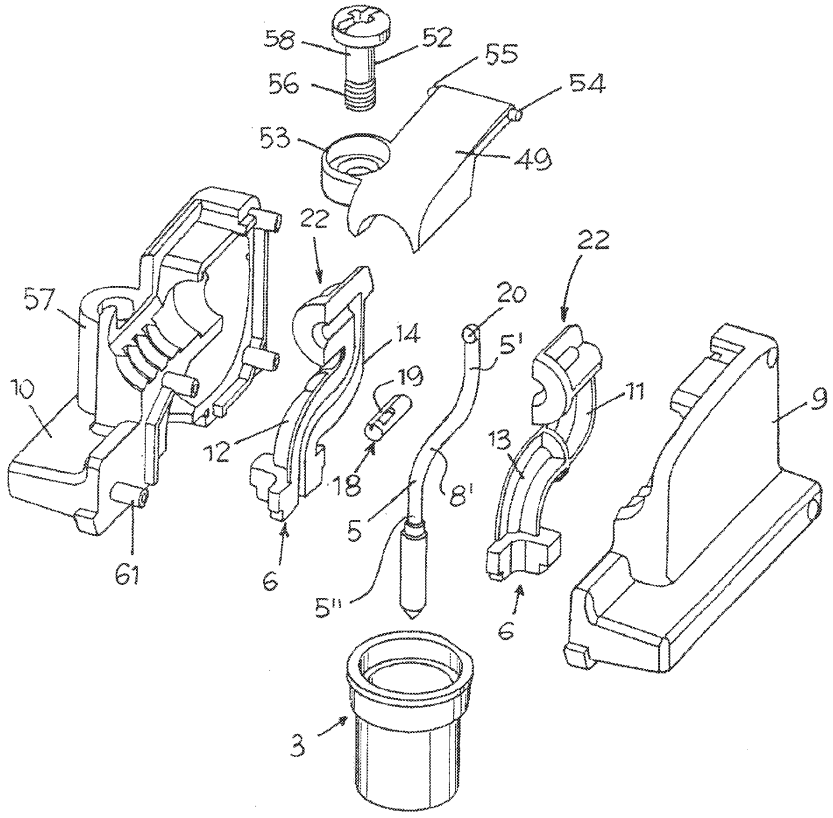

Fig.1

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Description

[0001] The present invention relates to an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, and to a method of manufacture thereof.

[0002] As known, coaxial electrical cables, especially those intended for being crossed by high frequency signals, such as shielded cables for television antennas or those suitable for microphone transmission signals, require a suitable protection, that is, proper shielding of the electromagnetic waves that are always present in the cable and in the environment, and which are often cause of noises and/or alterations both for the signal contained therein and for the outer environment.

[0003] The shielding generally consists of a braiding or mesh made up of thin copper wires that completely surrounds the electrical conductor that carries the signal and is kept insulated from the conductor by a sheath of insulating material arranged coaxially outside the conductor.

[0004] The shielding mesh must exhibit a regular arrangement of the component wires to keep the characteristic impedance of the coaxial cable constant.

[0005] In a known solution, to prevent or minimise the signal dispersions and alterations as the same flows from the coaxial cable through the connecting element that manages and/or distributes it, in general the latter provides to the separate clamping of the central cable and of the shielding braiding of the coaxial cable through flat terminals that cause a flattening thereof, which changes the cylindrical geometry of the coaxial cable itself.

[0006] To prevent the signal attenuation, especially for taps of satellite systems exhibiting a very extended connection with coaxial cable, some known connecting elements further comprise a box body inside which there is seated an electronic circuit on which the contacts to the upstream coaxial cable and to the downstream plug are preassembled.

[0007] The technical task of the present invention therefore is to provide an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, and a relevant method of manufacture thereof, which should allow eliminating the technical disadvantages of the prior art.

[0008] Within the scope of this technical task, an object of the invention is to provide an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, which should not introduce dispersion and/or noises to and from the outer environment and which should not alter the transmission signal.

[0009] Another object of the invention is to provide an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, having a very simplified structure which should minimise the attenuation of the transmission signal flowing therethrough.

[0010] Last but not least, another object of the invention is to provide an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, which should be easy to manufacture and assemble and which should have competitive costs as compared to what is currently available on the market.

[0011] The technical task, as well as these and other objects, according to the present invention, are achieved by an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, characterised in that between an input terminal and an output terminal thereof, it exhibits a coaxial transmission line that develops in continuity with said coaxial cable.

[0012] The present invention also discloses a method for manufacturing an element for connecting a reticular shielding coaxial cable for taps, plugs and the like, characterised in that it consists in forming a signal conductor by die casting or shearing and bending from a rolled band of a material, applying an electrically insulating coaxial coating thereto, forming an electromagnetic shielding body by die casting or shearing and bending from a rolled band of a material comprising at least two shells internally defining an impression of said signal conductor, placing said signal conductor between said shells and joining said shells.

[0013] Further features of the present invention are further defined in the following claims.

[0014] Further features and advantages of the invention will appear more clearly from the description of a preferred but non-exclusive embodiment of the element for connecting a reticular shielding coaxial cable for taps, plugs and the like according to the finding, illustrated by way of a non-limiting example in the annexed drawings, wherein:

[0015] figure 1 shows an exploded view of the parts of a connecting element according to an embodiment of the present invention;

[0016] figure 2 shows an assembled half of the connecting element of figure 1;

[0017] figure 3 shows a perspective view of the connecting element of figure 1, in a configuration of assembly with a coaxial cable;

[0018] figure 4 shows a perspective view of a connecting element according to a further embodiment of the present invention;

[0019] figure 5 shows a perspective view of an enlarged detail of the element of figure 4;

[0020] figure 6 shows a perspective view of a connecting element according to a further embodiment of the present invention;

[0021] figure 7 shows a perspective view of an enlarged detail of the element of figure 6.

[0022] With reference to the above figures, there is shown an element for connecting a reticular shielding coaxial cable for tap globally indicated with reference numeral 1.

[0023] Between an input terminal 2 and an output terminal 3 thereof, the connecting element 1 exhibits a coaxial transmission line 4 which develops in continuity with the coaxial cable 4' inserted in the input terminal 2.

[0024] According to an embodiment, the transmission line 4 comprises a signal conductor 5 which extends from a first to a second end portion 5', 5" suitable for being electrically connected to the input terminal 2 and to the output terminal 3 respectively. Conductor 5 exhibits an electrically insulating coaxial coating 6 seated in an impression 7 thereof obtained into an electromagnetic shielding body 8.

[0025] Advantageously, the transmission line comprises a signal conductor in a single piece that electrically connects the input terminal 2 directly to the output terminal 3. Such connection is direct, meaning that it does not require the interposition of any electrical circuit or electrical connecting plate, between the input terminal 2 and the output terminal 3. The transmission line 4 has a perfectly adapted morphology, thanks to which it minimises the attenuation of the flowing signal. Preferably, the signal conductor 5, as well as body 8, are obtained through die casting of an alloy, such as the so-called 'Zama' (Zn+Al+Mg), optionally coated with a galvanic treatment.

[0026] According to an embodiment, the signal conductor 5 exhibits a curved shape, in particular, an "S" shape. For example, the signal conductor 5 exhibits the two end portions 5', 5" substantially parallel to each other and connected by an intermediate portion 8'. Preferably, the intermediate portion 8' is substantially perpendicular thereto and suitably jointed to the same.

[0027] The fact that the signal conductor 5, and therefore also the transmission line 4, is curved, allows moving back the position of the input terminal 2 and thus gain space for the useful bending of the coaxial cable to other utilities (figure 3).

[0028] In other words, the intermediate portion 8' allows moving back the position of the end portion 5' so as to move back the input terminal 2 as much as possible. In this way, the coaxial cable can be inserted as much as possible into body 8 and can be addressed towards other utilities, that is, towards a side opposite to the output terminal 3 and parallel thereto, without exhibiting excessively small bending radiuses which could cause the cracking of the same. Moreover, the presence of a less strong bending favours and improves the signal transmission.

[0029] In any case, the signal conductor 5 may exhibit a different shape, for example rectilinear.

[0030] Body 8 exhibits at least two first half shells 9, 10 cooperating for defining impression 7.

[0031] The two first half shells 9 and 10 exhibit a radiofrequency insulating sheath mechanically obtained thereon, for example by creating during the same die casting of body 8, an external protrusion of a half shell 9, 10 and a mating slot of the other half shell 10, 9 wherein such protrusion can be engaged upon the assembly of body 8.

[0032] The two first half shells 9, 10 preferably exhibit a further added sheath (not shown) or a conductor adhesive for the radiofrequency insulation.

[0033] Coating 6 consists of two second half shells 11, 12 of plastic, each internally carrying a semi impression 13, 14 of the signal conductor 5 on which they are applied.

[0034] Alternatively, the insulating coating 6 may be of plastic over-pressed on the signal conductor 5.

[0035] Coating 6 exhibits special material lightenings 16 for imparting the desired impedance to the transmission line 4. In particular, said lightenings 16 are used for eliminating as much as possible the presence of material, such as plastics, and reproducing as much as possible the dielectric constant of the air.

[0036] The connecting element 1 further exhibits a tubular structure 18 with spring-wise operation, thanks to a spring element 19, such as a flat spring, wherein the central element of the coaxial cable 4' is inserted and held against an abutment 20 of the signal conductor 5.

[0037] The tubular structure 18 is seated within a first extension 22 of coating 6 in turn present into a second extension 24 of impression 7 of body 8.

[0038] Extension 22 of coating 6 exerts a containment action that keeps the tubular structure 18 into proper position. In particular, according to an advantageous embodiment of the present invention (figure 4,5,6,7), at least one of the second half shells 11, 12 of coating 6 comprises a projection 26 protruding from the half shell itself towards the tubular structure 18 so as to influence in closing, and thus in compression, at least one portion of the tubular structure 18, preferably at abutment 20, that is, at the portion wherein the tubular structure 18 fits on the signal conductor 5.

[0039] Preferably, according to an embodiment, each of said second half shells 11, 12 comprises, opposite to the tubular structure 18, a pin 32, preferably arranged at projection 26, but opposite thereto, so as to be influenced by the first half shells 9, 10 in a closed configuration of the same. In other words, by closing the half shells 9, 10, they abut against pins 32 and compress the half shells 11, 12 at projection 26. Thus, after the closure of the device, the tubular structure 18 is blocked in compression inside seat 28.

[0040] In an optional embodiment (figures 6, 7), the central element of the coaxial cable 4' is connected to the tubular structure 18 and to the signal conductor 5 with the interposition of a condenser 36.

[0041] Condenser 36 insulates the transmission line 4 from low frequency electrical phenomena that generate in the outer environment.

[0042] Condenser 36 could for example be of the cylindrical or parallelepipedal type. According to an embodiment, a

first end 38 of condenser 36 engages on a fork 40 obtained on the first end portion 5' of conductor 5, so as to form a shape coupling therewith. Preferably, a peg 42 of conductor material, is interposed between the tubular structure 18 and condenser 36, suitable both for forming an electrical connection between condenser 36 and the tubular structure 18, and for influencing condenser 36 in abutment against said fork 40. Preferably, said peg 42 is made integral with the tubular structure, for example as a tab integrally protruding from the body of the tubular structure 18.

[0043] Preferably, half shells 11, 12 comprise a seat 44 obtained inside said semi impressions 13, 14. Seat 44 advantageously seats condenser 36 so as to block the same into electrical contact position with the conductor element 5.

[0044] Body 8 exhibits a port 49 for accessing the input terminal 2.

[0045] Port 49 and/or the input terminal 2, in particular both, exhibit anchoring jaws 50, 51 that minimise the crushing of the reticular shielding of the coaxial cable.

[0046] Jaws 50, 51 exhibit a triangular section or triangular with circular unions.

[0047] Port 49 carries a screw 52 exhibiting a threaded stem portion 56 screwable in a counter-threaded seat 57 obtained on body 8, and a stem portion 58 released on the diameter close to the head for moving axially but in a lockable manner within its seat 53.

[0048] The hinge of port 49 is formed through two aligned cylindrical protuberances 54, 55 made integral into port 49, and inserted into two complementary cylindrical slots obtained in shells 9 and 10 of body 8.

[0049] The signal conductor 5, the half shells 9 and 10 and port 49 of body 8 are manufactured through die casting for constructing the connecting element 1.

[0050] Alternatively, such components may be manufactured by shearing and bending from a rolled band of a suitable metal material.

[0051] The coating, coaxial 6 or by over-pressing, or by flat pressing a single plastic piece defining the two halves of coating 6 and then overlapping such halves with the interposition of the signal conductor 5 and of the tubular structure 18, is applied to the signal conductor 5 and to the tubular structure 18.

[0052] The complex thus obtained is provided with opening 60 of the output terminal 3 and placed between shells 9 and 10 of the body that are clamped with the interposition of the radiofrequency insulating sheath.

[0053] The final union between shells 9 and 10 is obtained by riveting some protuberances 31 inserted into mating slots 62.

[0054] As a variation, the union between shells 9 and 10 of body 8 can be obtained with three-lobe lag screws inserted into holes obtained in body 8 in the die casting.

[0055] Finally, body 8 is inserted into a wall box with which it engages, preferably by snap-wise means. Of course, other changes and variations are possible besides those already mentioned.

[0056] For example, the connecting element 1 exhibits an output terminal 3 with a male IEC shape, but such output terminal 3 can without distinction exhibit a female IEC shape or an "F" shape or other connectors.

[0057] In particular, as seen in the figures, a high number of shared components may be used for the different shapes of the output terminal, without changing the basic pattern of body 8.

[0058] The difference between the various shapes of the output terminal 3 is obtained by sharing the basic structure and providing the signal conductor 5 with just an interchangeable tang that adapts to the shape of the output terminal 3.

[0059] As it can be understood from the description, the described connecting element allows overcoming the disadvantages of the connecting elements of the prior art.

[0060] In fact, the connecting element allows using a single connection between an input and an output without the aid of any printed circuit.

[0061] In fact, thanks to the element according to the present invention, no multiple connecting devices are required when a single connection is needed between an input and an output.

[0062] Such multiple devices typically comprise a printed circuit suitable for managing multiple connections; however, such circuit causes signal noises and increases the production and assembly costs.

[0063] Thanks to the element of the present invention, on the other hand, it is possible to use an element having a single input and a single output without the interposition of any printed circuit, so as to reduce the overall dimensions and costs while ensuring higher clarity of the transmitted signal.

[0064] The described connecting element also allows a more regular and rational arrangement of the coaxial cables connected thereto. In fact, coaxial cables are typically connected to the input terminal and thus curved opposite to the output terminal. Due to the overall dimensions and to the arrangement of the connecting elements, said coaxial cables must undergo sudden bending right at the input terminal. Thanks to the fact that the signal conductor has a curved shape, for example an 'S' shape, or in any case such as to extend opposite to the input terminal, it is possible to move back the input terminal as much as possible so as to ensure a smoother bending of the coaxial cable. Such more favourable bending prevents the cable cracking, facilitates the coaxial cable assembly and improves the signal transmission.

[0065] The structure of the containment half shells of the conductor always ensures the electrical continuity between the input terminal and the output terminal. The presence of projections and pins ensures a pressure action that facilitates

the blocking and the containment of the conductor element and of the optional condenser.

[0066] Several changes and variations can be made to the connecting element thus conceived, all falling within the scope of the inventive concept; moreover, all details can be replaced with technically equivalent elements.

[0067] **In** the practice, the materials used as well as the sizes, can be whatever, according to the technical requirements and to the prior art.

Claims

1. An element (1) for connecting a reticular shielding coaxial cable for taps, plugs and the like, **characterised in that** between an input terminal (2) and an output terminal (3) thereof, it comprises a coaxial transmission line (4) that develops in continuity with said coaxial cable.

2. A connecting element (1) according to claim 1, wherein said transmission line (4) comprises a signal conductor (5) exhibiting an electrically insulating coaxial coating (6) seated in an impression (7) thereof obtained into an electromagnetic shielding body (8).

3. A connecting element (1) according to claim 1 or 2, wherein the transmission line (4) comprises a signal conductor (5) in a single piece that electrically connects the input terminal (2) directly to the output terminal (3).

4. A connecting element (1) according to any one of the previous claims, wherein said signal conductor (5) is made by die casting.

5. A connecting element (1) according to any one of the previous claims, wherein said signal conductor (5) exhibits a curved shape for the backing of said input terminal (2).

6. A connecting element (1) according to any one of the previous claims, wherein the signal conductor (5) exhibits a first and a second end portion (5', 5") electrically connected to the input terminal (2) and to the output terminal (3) respectively, substantially parallel to one another, and connected by an intermediate portion (8') substantially perpendicular thereto.

7. A connecting element (1) according to any one of the previous claims, wherein said signal conductor (5) exhibits a rectilinear shape.

8. A connecting element (1) according to any one of the previous claims, wherein said body (8) exhibits at least two first die cast half shells (9, 10) cooperating for defining said impression (7).

9. A connecting element (1) according to claim 8, wherein said two first half shells (9, 10) exhibit a radiofrequency insulating sheath directly mechanically obtained thereon.

10. A connecting element (1) according to claim 8 or 9, wherein said two half shells (9, 10) exhibit a further radiofrequency insulating sheath added thereinbetween.

11. A connecting element (1) according to any one of the previous claims, wherein said coating (6) is made of plastic over-pressed on said signal conductor (5).

12. A connecting element (1) according to any one of the previous claims, wherein said coating (6) consists of two second half shells (11,12) of plastic, each internally carrying a semi impression (13, 14) of said signal conductor (5) on which they are applied.

13. A connecting element (1) according to any one of the previous claims, wherein said coating (6) exhibits special material discharges (16) for imparting the desired impedance to said transmission line (4).

14. A connecting element (1) according to any one of the previous claims, **characterised in that** it exhibits a tubular structure (18) with spring-wise operation wherein the central element of said coaxial cable is inserted and held against an abutment (20) of said signal conductor (5) .

15. A connecting element (1) according to any one of the previous claims, wherein said tubular structure (18) is seated

within a first extension (22) of said coating (6) in turn present into a second extension (24) of said impression (7) of said body (8).

16. A connecting element (1) according to claims 14 or 15, wherein at least one of the second half shells (11, 12) of the coating (6) comprises a projection (26) protruding from the half shell itself towards the tubular structure (18) so as to influence in closing at least one portion of the tubular structure (18).

17. A connecting element (1) according to claim 16, wherein said at least one projection (26) is arranged so as to influence said tubular structure (18) at a spring element (19) for blocking the coaxial cable (4') to be connected.

18. A connecting element (1) according to claim 16 or 17, wherein said projection (26) also forms an abutment or stop in the introduction of the tubular element (18), so as to delimit a first seat (28) for containing the element (18).

19. A connecting element (1) according to any one of claims 12 to 18, wherein at least one of said second half shells (11,12) comprises, opposite to the tubular structure (18), a pin (32) so as to be influenced by the first half shells (9, 10) in a closed configuration of the same.

20. A connecting element (1) according to any one of the previous claims, wherein the central element of said coaxial cable is connected to said signal conductor (5) with the interposition of a condenser (36).

21. A connecting element (1) according to claim 20, wherein the condenser (36) comprises a first end (38) that engages on a fork (40) obtained on a first portion (5') of the conductor (5), so as to form a shape coupling therewith.

22. A connecting element (1) according to claim 20 or 21, wherein a peg (42) of conductor material is interposed between the tubular structure (18) and the condenser (36), suitable for forming an electrical connection between the condenser (36) and the tubular structure (18) and for influencing the condenser (36) in abutment against said fork (40).

23. A connecting element (1) according to claim 22, wherein said peg (42) is integral with said tubular structure (18).

24. A connecting element (1) according to any one of claims 20 to 23, wherein said second half shells (11, 12) comprise a seat (44) obtained inside said semi impressions (13, 14), said seat (44) seating the condenser (36) so as to block the same into electrical contact position with the conductor element (5).

25. A connecting element (1) according to any one of the previous claims, wherein said body (8) exhibits a port (49) for accessing said input terminal (2).

26. A connecting element (1) according to any one of the previous claims, wherein said port (49) and/or said input terminal (2) exhibits anchoring jaws (50, 51) that minimise the crushing of the reticular shielding of said coaxial cable.

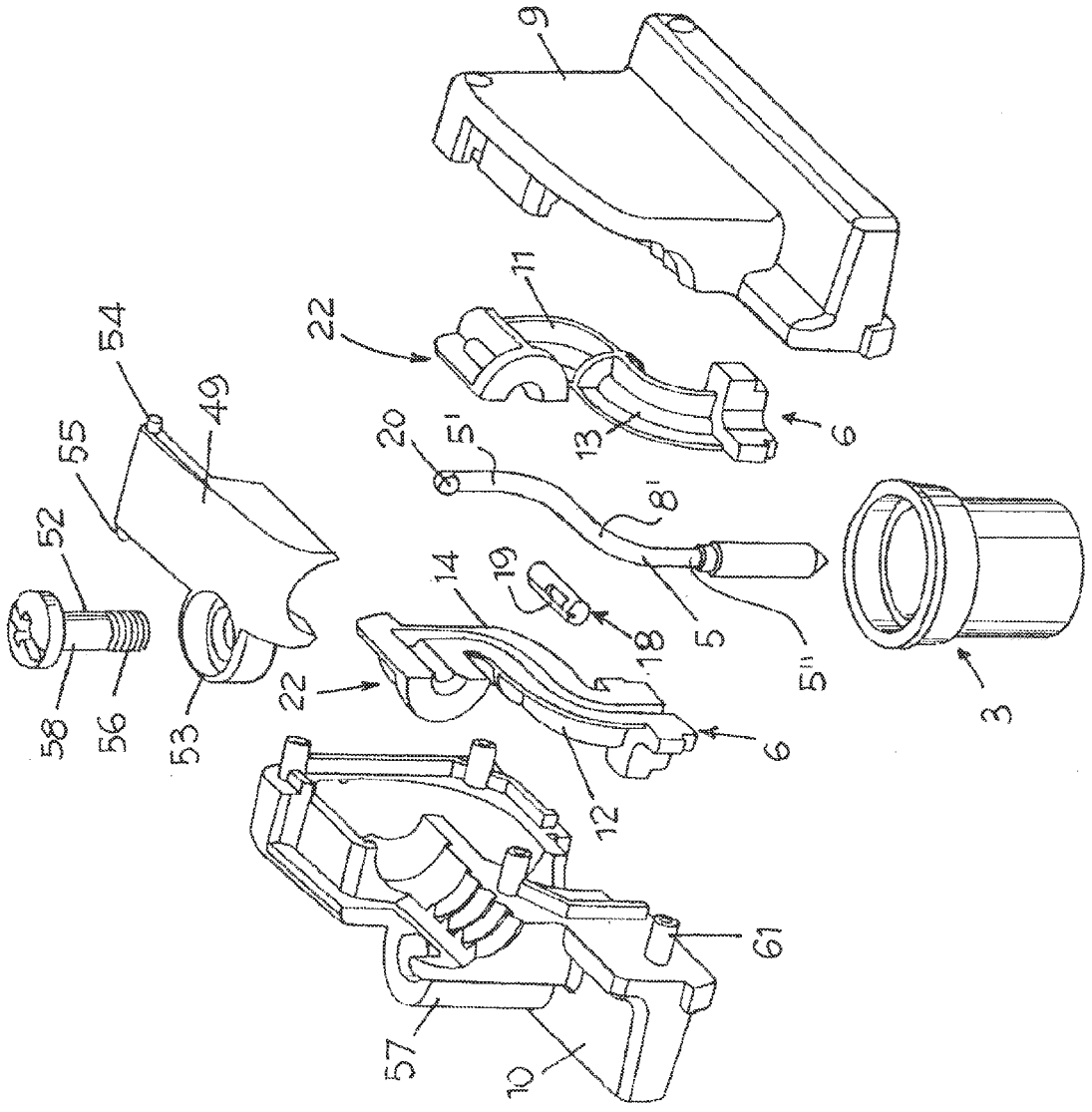
27. A method for manufacturing an element (1) for connecting a reticular shielding coaxial cable (4') for taps, plugs and the like, comprising the steps of:

manufacturing a signal conductor (5) by die casting or shearing and bending from a rolled band of a material, applying an electrically insulating coaxial coating (6) thereto, forming an electromagnetic shielding body by die casting or shearing and bending from a rolled band of a material, comprising at least two shells (9, 10) internally defining an impression (7) of said signal conductor (5), placing said signal conductor (5) between said shells (9, 10) and connecting said shells (9, 10).

28. A method according to claim 27, wherein said coating (6) is made by over-pressing of a plastic material.

29. A method according to claim 27, wherein said coating (6) is made by flat pressing of a single plastic piece defining two halves of said coating.

Fig. 1



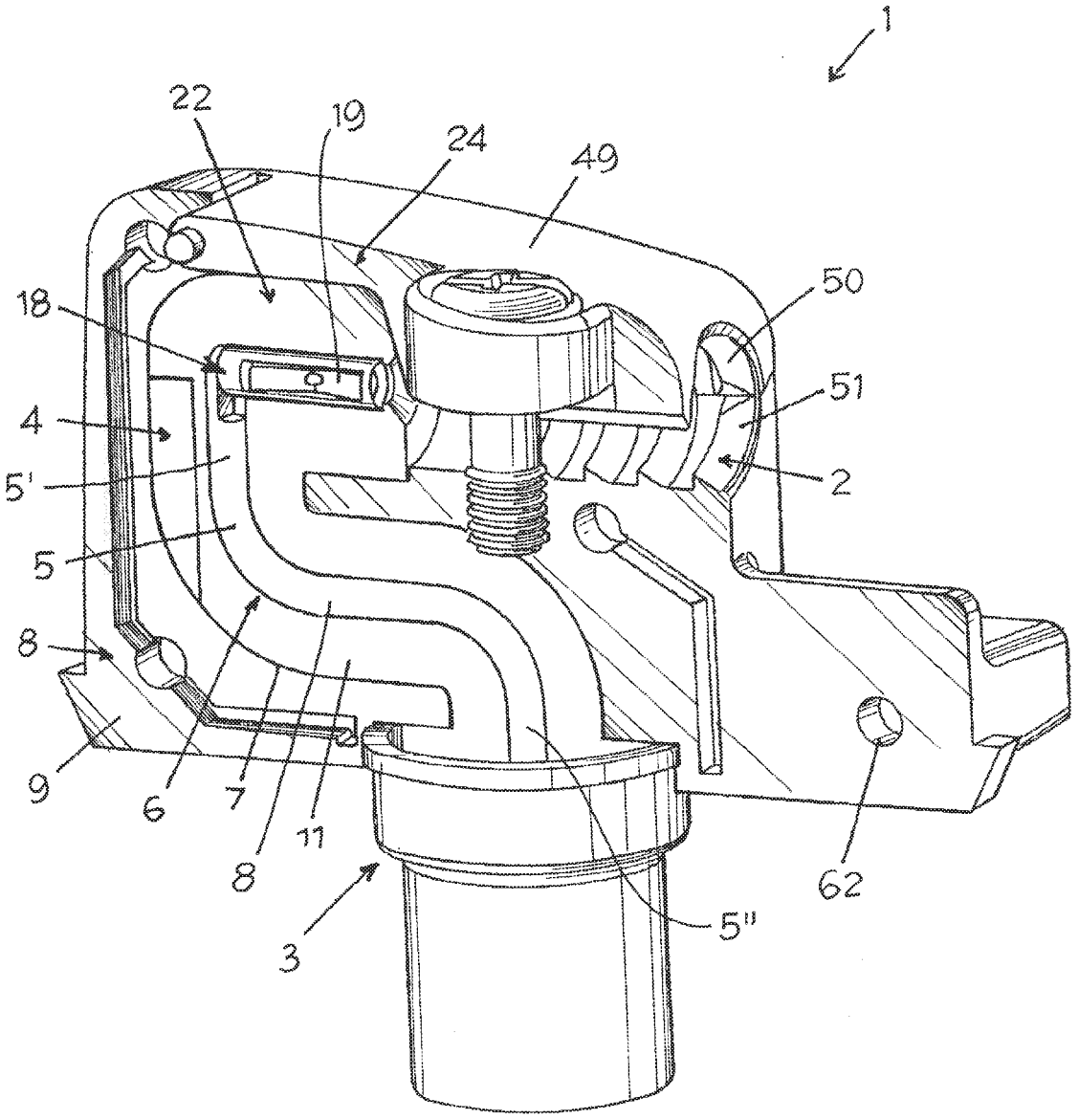


Fig.2

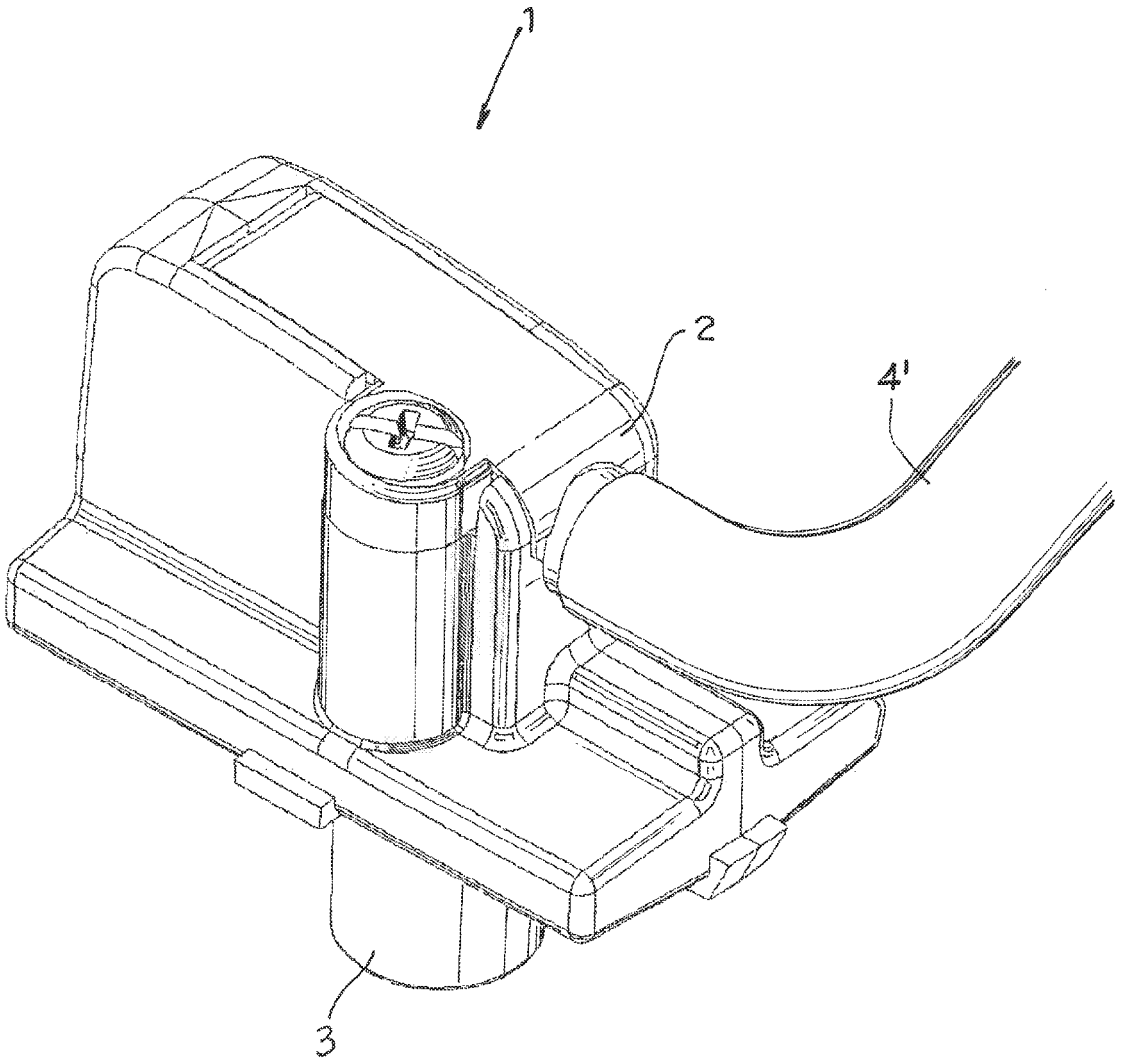


Fig.3

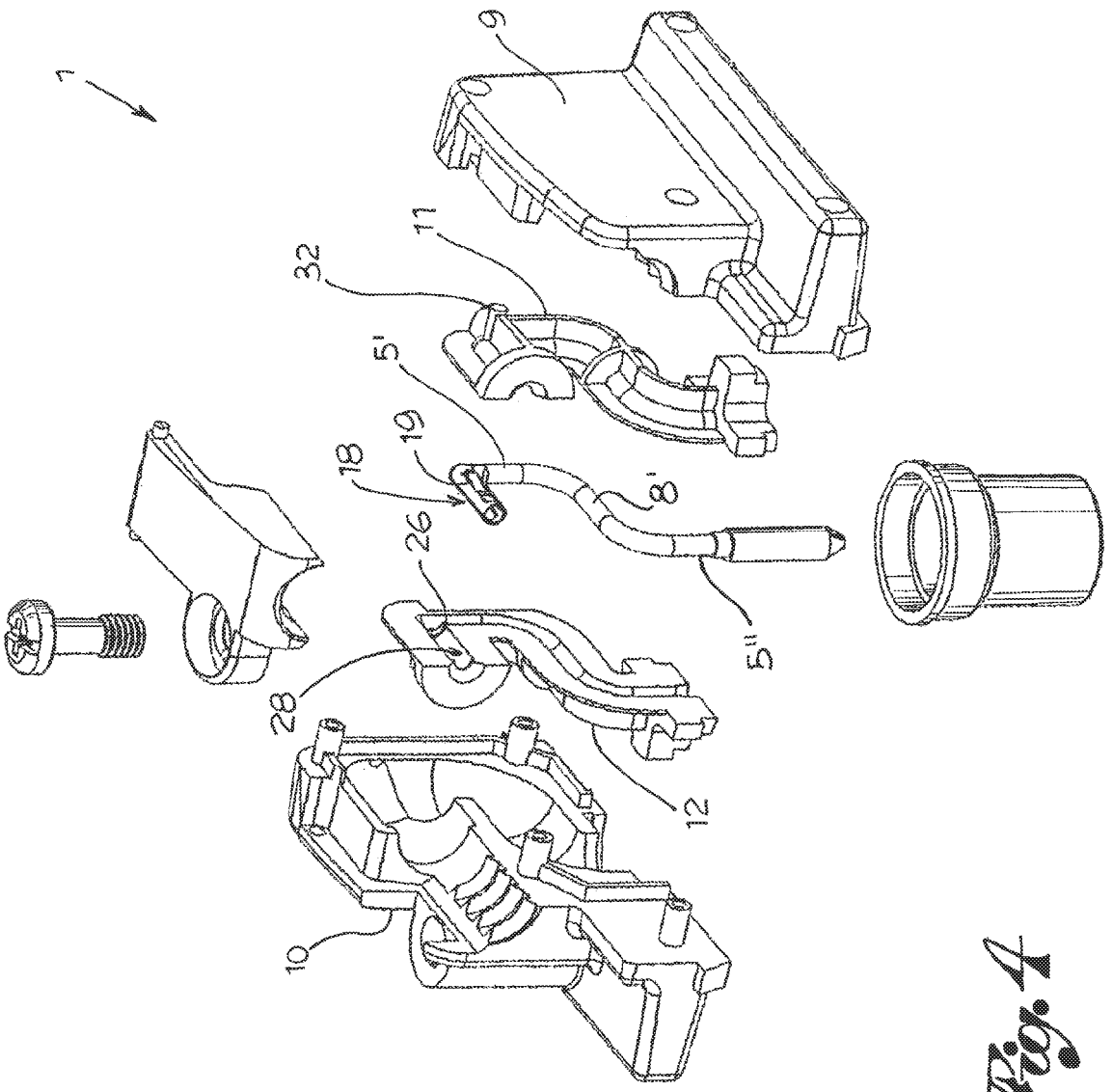


Fig. 4

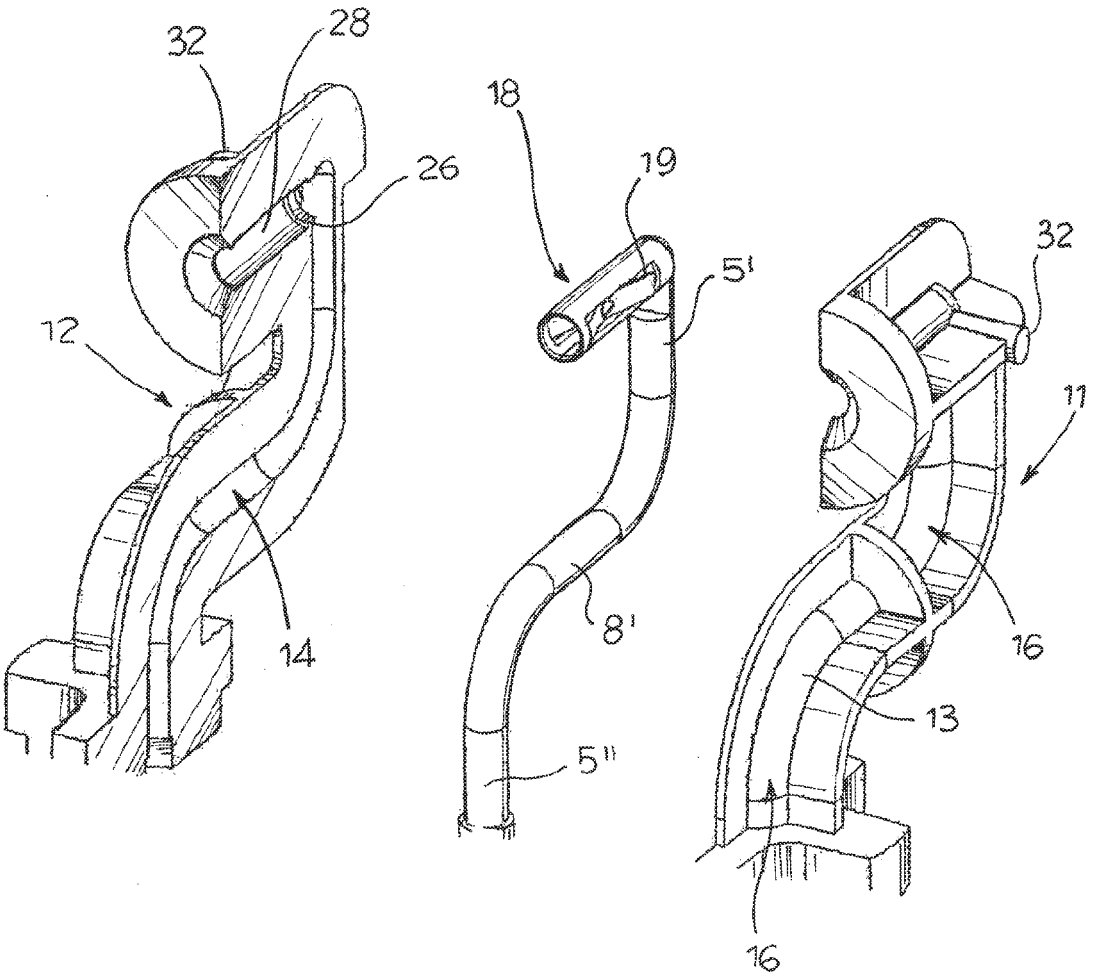


Fig.5

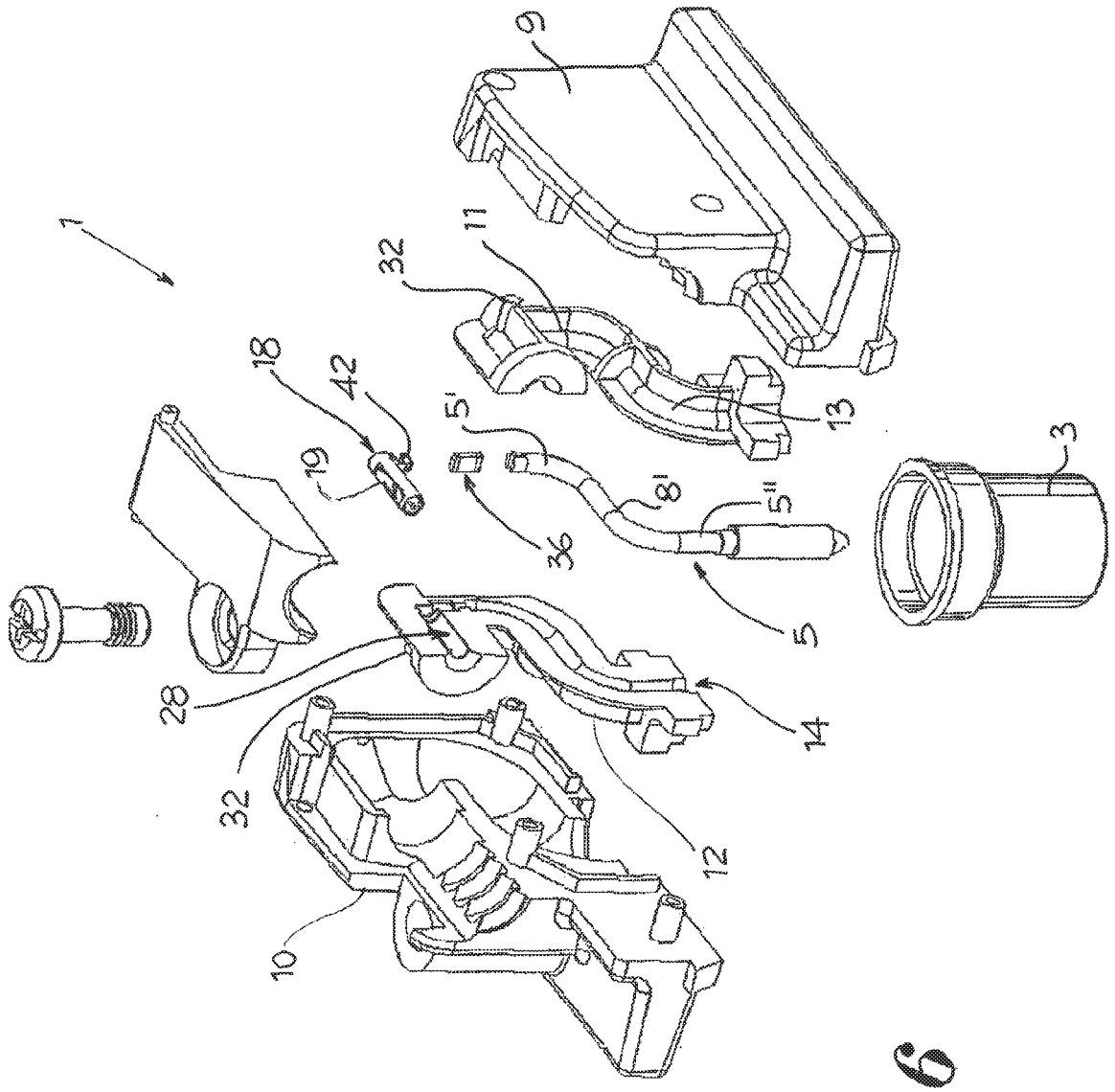


Fig. 6

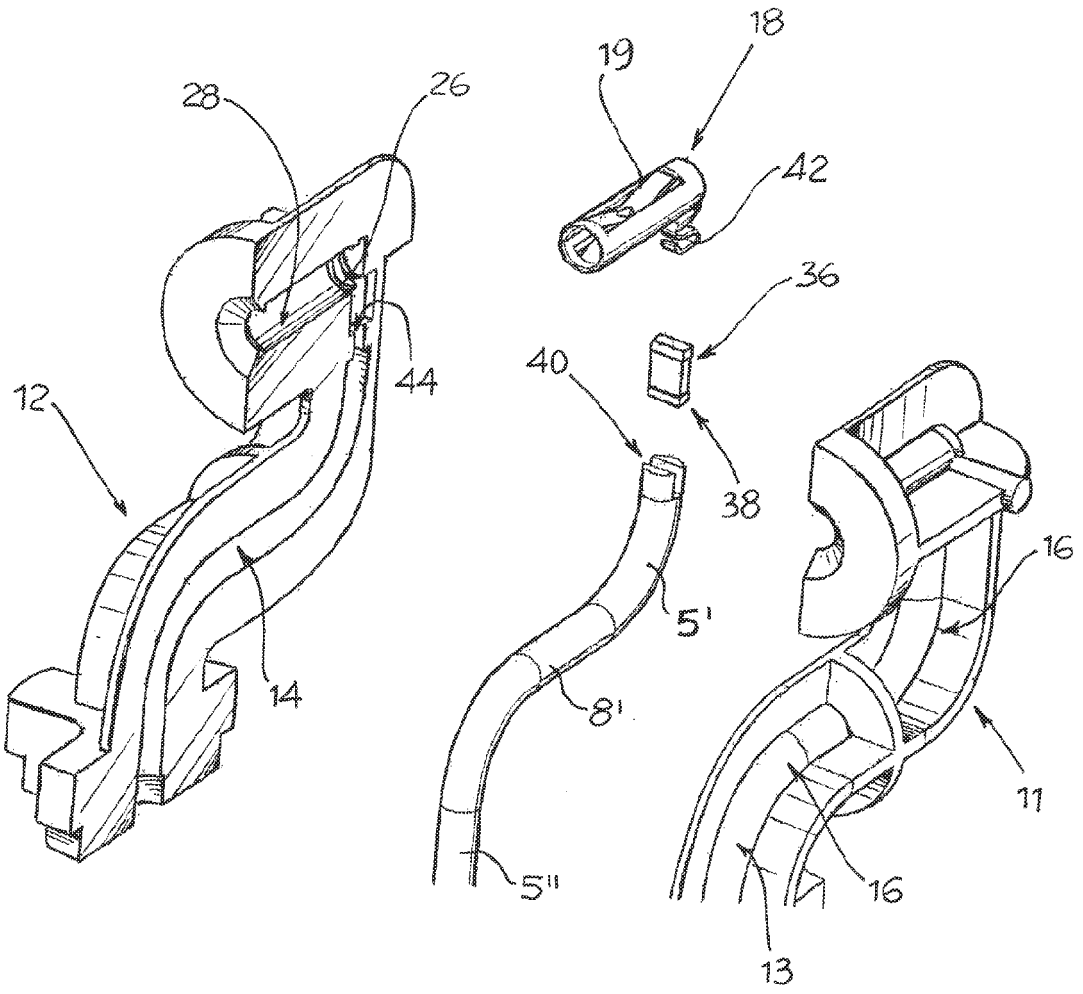


Fig. 7