

Description

The invention relates to a branch connector for coaxial cable having at least one inner conductor surrounded by an inner insulation sheath, said inner sheath being surrounded by at least one outer conductor and an outer insulation sheath respectively, said branch connector comprising an elongated housing of electrically conductive material, at least one end of which being provided with a feed-through channel for receiving the coaxial cable and at least one electrically conductive tooth adapted for contacting the outer conductor of the coaxial cable, an electrically conductive penetration pin axially arranged in the housing, said penetration pin being electrically insulated from the housing, at least one end of said penetration pin having a point radially penetrating in said feed-through channel and adapted for contacting the inner conductor of the coaxial cable and having an insulation sheath for preventing electrical contact with the outer conductor of the contacted coaxial cable, and at least one clamping element for retaining the contacted coaxial cable in said feed-through channel.

A branch connector of this type is known from British patent application GB-A-2,082,850.

Due to the great increase in the use of micro-computers, home computers, word processing equipment and their accompanying visual display terminals, printer units, memory equipment etc., it is often necessary, for the transfer of information between the various users in practice, to have a local connection network by means of which this equipment can be interconnected. In office environments in particular, it is often necessary, for the connection of equipment, to have the possibility of branching off this connection network at any desired points.

A large number of units can be interconnected by means of coaxial cable and for that purpose have suitable coaxial junction boxes. These local interconnection networks are therefore largely built up of coaxial cable.

In the current networks the equipment is still generally connected by means of terminal boxes. This means a T-shaped interconnection element, which is provided with coaxial junction boxes, and to each end of which a coaxial cable is connected by means of a coaxial plug. This manner of connection is fairly expensive for building up a local connection network, and it is not possible with it to make branches in a cable in use without interruption the stream of information flowing through it.

With the branch connector disclosed by the above-mentioned British patent application, branching of a cable in use can be achieved, but this requires two successive operations. First, the coaxial cable to be branched must be confined in the

feed-through channel using finger pressure, in which for contacting said cable an adequate amount of force is required. Particularly for a stiff cable, i.e. a cable with insulation sheaths of a mechanically hard to penetrate material or a cable with relative thick conductors, a considerable amount of force may be required.

After the cable is seated in the feed-through channel, a connector cover has to be slideably fitted over the feed-through channel, to prevent the cable from being pressed out of the feed-through channel. In order to fit this connector cover, it is required that the cable is completely received in the feed-through channel, as seen in longitudinal direction of the housing of the connector. When part of the periphery of the cable protrudes the feed-through channel, it is not possible or just very difficult to fit this connector cover, in which there is also a possibility that the outer insulation sheath of the cable may be damaged by the connector cover sliding over the cable. Further, the connector cover provides no relief against tensile forces in longitudinal direction of the cable. These tensile forces will be fully transferred to the penetration pin and the at least one tooth, which is not favourable to the reliability and durability of the electrical connections.

In view of the above-described disadvantages, the object of the invention is to provide a branch connector of the type referred to in the preamble, with which coaxial cables can be durably and reliably branched in one rapid and simple operation. The branch connector according to the invention is characterized in that said housing is circular cylindrical in shape, the penetration pin is locked inside the housing on a transverse supporting disc of insulation material, while the at least one clamping element consist of a sleeve having at one end thereof a feed-through channel corresponding to the feed-through channel of the cylindrical housing and adapted to be fitted over the jacket of the cylindrical housing such that said feed-through channels are opposite each other to form one feed-through channel for receiving the coaxial cable and a cap for coupling with said sleeve for contacting and firmly retaining the coaxial cable in the one feed-through channel.

As before mentioned, in the British patent application the coaxial cable has to be received and contacted in the feed-through channel by finger pressure. Such uncontrolled push-in can lead to deformation of the cable, and the possibility that the penetration pin penetrates not exactly radially in the cable, as result of which the inner conductor can be insufficiently contacted so that no reliable connection will be established, or the penetration pin may even arrive in the inner insulation sheath adjacent the inner conductor, without contacting the

latter.

By coupling together the sleeve and the cap according to the invention, a controlled force is exerted radially on the coaxial cable. Under the influence of this force, the penetration pin and the at least one tooth successfully penetrate into the cable for contacting the inner and the outer conductor, respectively. In contacted state, the cable is firmly confined between the cap and the sleeve, as a result of which the electrical connections are relieved of tensile forces in longitudinal direction of the cable.

In a preferred embodiment of the invention said cap is a screw cap having screw thread and said sleeve is a screwed sleeve having screw thread at the end thereof provided with its feed-through channel such that said screw cap and screwed sleeve form a screw coupling.

In contacted state only the penetration pin makes by means of its conducting point contact with the inner conductor of the coaxial cable to be contacted. Accordingly, in a further embodiment of the invention wherein the feed-through channel of the housing is accessible from said one end thereof, the at least one tooth projects a distance less than the point of the penetration pin into the feed-through channel of the housing, said feed-through channel is defined by two approximately U-shaped notches disposed diametrically opposite each other in the jacket of the cylindrical housing, on at least one narrow edge of said notches said at least one tooth is provided.

In order to obtain an evenly distributed force on the cable for avoidance as far as possible of deformation of the cable during contacting, in the preferred embodiment of the invention an approximately U-shaped supporting surface is provided inside the sleeve, said U-shaped supporting surface having openings for feeding through the penetration pin and the at least one tooth respectively, said supporting surface together with the U-shaped notches in the sleeves forming the feed-through channel thereof.

With the same object of providing an evenly distributed force on the cable when contacting, in another embodiment of the invention a tubular pressure element is provided concentrically inside the cap, said pressure element being adapted to fit into the sleeve or the housing, and one closed end face of said pressure element coincides with the open end of the cap.

In order to avoid displacement of the contacted coaxial cable in longitudinal direction of the housing, in a yet further embodiment of the invention the housing and the sleeve are provided with means for retaining and positioning the sleeve with respect to the housing, in such a way that in the fitted state the one feed-through channel is open

for receiving the coaxial cable.

Said retaining and position means may take the form of an engaging boss and opening, preferably a trapezoidal boss for slideably locking said sleeve and housing. In the embodiment of the connector having a sleeve provided with the U-shaped supporting surface, at least one projecting trapezoidal boss is provided internally along the periphery of the sleeve between the end thereof not provided with its feed-through channel and the convex side of the supporting surface, said at least one trapezoidal boss being adapted to engage with at least one corresponding opening of the housing at the end thereof provided with its feed-through channel.

In order to avoid faulty contacts as much as possible, one must also prevent the penetration pin from moving in axial and/or radial direction inside the housing. In the preferred embodiment of the invention, the penetration pin is attached to a carrier strip in which the insulation material of the transverse supporting disc grips for the purpose of preventing axial and radial shifting of the penetration pin within the supporting disc, and the end of said penetration pin for penetrating into the coaxial cable being enclosed over a part by the insulation material of the supporting disc in order to prevent electrical contact with the outer conductor of the coaxial cable to be contacted.

By designing the other end of the penetration pin as a contact socket or contact pin, one forms with the end of the circular cylindrical housing, not provided with the one feed-through channel, either a coaxial coupling socket or a coaxial plug for connecting in a simple manner the cable or equipment to be connected. It will be clear that the branch connector designed in this way according to the invention can also advantageously be used as the end connector for a coaxial cable.

Because, according to a further embodiment of the invention the supporting disc with the penetration pin is detachably locked inside the housing by an engaging boss and opening, it is with one type of housing and clamping means possible to form a branch connector with either a coaxial coupling socket or a coaxial plug output, simply by replacing the supporting disc with the penetration pin.

If a branch with a plug connection is not desired or necessary, for example if an additional coaxial cable has to be used between the branch point and the equipment for connection, in another embodiment of the branch connector according to the invention both ends of the housing are provided with a feed-through channel, each of which having at least one tooth, both ends of the penetration pin having a point penetrating in a feed-through channel, wherein at each end of said housing a sleeve having a feed-through channel is fitted, such that

two feed-through channels are formed for receiving a coaxial cable, and in that for coupling with each sleeve a cap being provided.

The invention will now be explained in greater detail with reference to the examples of embodiments shown in the drawings.

Fig. 1 shows a drawing in perspective with disassembled parts of a preferred embodiment of the housing and the penetration pin of the branch connector according to the invention;

Fig. 2 shows in perspective the housing of the branch connector according to Fig. 1, with the penetration pin fitted therein, partially shown by dotted lines;

Fig. 3 shows a drawing in perspective with disassembled and "cutaway" parts of a preferred embodiment of a clamping element of the branch connector according to the invention, together with the fitted branch connector from Fig. 2;

Fig. 4 shows a drawing in perspective with "cutaway" parts of the preferred embodiment of the branch connector according to Fig. 3, in which part of the clamping element is fitted over the housing;

Fig. 5 shows on an enlarged scale with "cutaway" parts a preferred embodiment of the branch connector according to the invention, with a contacted coaxial cable confined therein;

Fig. 6 shows in various stages and views the structure of the penetration pin and the supporting disc according to the preferred embodiment of the present invention;

Fig. 7 shows a further embodiment of a branch connector according to the present invention;

Fig. 8 shows a drawing in perspective with disassembled and "cutaway" parts of a further preferred embodiment of the branch connector according to the invention for contacting of two coaxial cables;

Fig. 9 shows a drawing in perspective with "cutaway" parts of the preferred embodiment of the branch connector according to Fig. 8, in the partially fitted state; and

Fig. 10 shows a branching of a coaxial cable by means of branch connectors according to Fig. 4 and Fig. 9.

The preferred embodiment of the branch connector according to the invention illustrated in Fig. 1 shows a cylindrical housing 1 of spring-loaded electrically conducting material with a longitudinal seam 2. This longitudinal seam is closed under the influence of the spring force of the housing itself. Formed at one end of the housing by U-shaped notches 3 is a feed-through channel 4 running through in the radial direction. Formed at the base of each U-shaped notch is a tooth 5 which projects into the feed-through channel and has a pointed

end 6 and sharp edges 7. The housing is provided along its periphery with circular rows of openings 8 and 9, said rows being displaced relative to each other in the longitudinal direction. From the two ends of the housing, provision is made in the longitudinal direction thereof for several slits 10 and 11, which preferably coincide with the longitudinal seam 2 as shown in Fig. 1. The slits are widened over a length at the ends of the housing.

The penetration pin 12 of electrically conducting material to be fitted in the housing 1 is provided, at the end penetrating into the coaxial cable to be contacted, with a sharply tapered conducting point 13, in such a way that this point together with the through-running insulation material 14 - conically tapered round the pin - of the transverse supporting disc 15 forms an externally smooth surface. In the embodiment shown in Fig. 1 the other end of the penetration pin is designed as a socket 16 with at least one slit 18 in the longitudinal direction thereof.

The penetration pin with the supporting disc fitted around it is subsequently fitted therein, overcoming the spring force of the housing, in such a way that the radially outward projecting bosses 17 of the supporting disc engage with the openings 9 of the housing, as shown in Fig. 2. The openings 9 and the projecting bosses 17 are provided in such a way that, after fitting of the penetration pin in the housing, the conducting point 13 as a whole projects further outwards into the feed-through channel 4 than the teeth 5.

It will be clear that the spring force of the material of the housing has to have such strength that, on the one hand, the supporting disc can be fitted easily by hand and, on the other, the supporting disc is locked by means of the bosses 17 engaging in the openings 9, against axial and tangential displacement through forces acting thereon during normal use of the branch connector. Although the bosses 17 and the openings 9 are designed as circular in shape, it will be clear that other shapes (rectangular, square etc.) can also be used.

As can be seen clearly from Fig. 2, the socket 16 together with the end of the housing not provided with a feed-through channel forms a coaxial coupling socket. It will be clear that, instead of being designed as a socket, the end of the penetration pin can also be designed as a contact pin, as a result of which a coaxial plug is formed (not shown). A coaxial cable contacted by the penetration pin and the teeth of the housing can in this way be connected simply to a coaxial junction box of a piece of equipment to be connected. By means of the slits 11, 18, tolerance differences occurring can be overcome in a simple manner.

Fig. 3 shows in perspective the fitted branch

connector of Fig. 2 and a preferred embodiment of the clamping element according to the invention, in which a part thereof is "cut away" for the purpose of showing clearly the internal layout of the clamping element. Shown on the left of the mounted housing are the two separate parts of the clamping element for confining in the feed-through channel the coaxial cable to be contacted, namely the screwed sleeve 19 and the screw cap 20. The internal diameter of the screwed sleeve is slightly larger than the external diameter of the housing. The screw cap 20 contains internal screw thread 21 which mate with the external screw thread 22 of the screwed sleeve 19. At the end provided with screw thread, the screwed sleeve has a corresponding feed-through channel 25, which is formed by U-shaped notches 23 and an approximately U-shaped supporting surface 24, for accommodation and through-feed of the coaxial cable to be contacted. In the supporting surface 24, along the periphery, are openings 26 and in the centre thereof an opening 27 through which - after the screwed sleeve is fitted over the housing - the teeth 5 and the penetration pin 12 project into the corresponding feed-through channel 25.

Formed on the inside at the end of the screwed sleeve which is not provided with screw thread are radially projecting trapezoidal bosses 28, of which one slanting side 29 rests against the open end of the screwed sleeve, and of which the other straight side 30 is adjacent to the convex side of the supporting surface 24. Only one of such trapezoidal bosses 28 can be seen in the drawing in Fig. 3.

These trapezoidal bosses 28 can mate with rectangular openings 8 provided in the jacket of the housing along the periphery thereof, in such a way that when the screwed sleeve is fitted from the end of the housing provided with the feed-through channel the bosses 28 engage with the openings 8, as shown in Fig. 4. Through the straight side 30 of the respective trapezoidal bosses 28 and the convex side of the supporting surface 24, the fitted screwed sleeve is prevented from being displaced in the longitudinal direction of the housing under the effect of the forces acting thereon during normal use. The relative placing and dimensions of the trapezoidal bosses 28 and the openings 8 in the housing are chosen in such a way that the screwed sleeve can be locked to the housing only in that position in which the feed-through channels 4 and 25 of the housing and the screwed sleeve respectively lie opposite each other. The convex side of the supporting surface 24 and the U-shaped notches 3 of the housing have such dimensions that the convex part of the supporting surface fits into these notches. Together with the trapezoidal bosses 28, this in an effective manner prevents the

screwed sleeve from turning in the tangential direction as a result of the screw cap being screwed on the screwed sleeve.

The projecting bosses 17 on the supporting disc 15 and the accompanying openings 9 in the housing 1 are chosen in a different shape compared with the projecting bosses 28 of the screwed sleeve 19 and the accompanying openings 8, in order to prevent the penetration pin from being fitted wrongly into the housing through the projecting bosses 17 engaging in the openings 8.

The openings 70 along the periphery of the supporting surface 24 are produced for manufacturing reasons during the formation of the trapezoidal bosses 28. The grooves 71 in the wall of the screwed sleeve 19 serve purely to save material.

The screw cap contains a pressure element 31 which fits concentrically in tubular form in the interior of the screwed sleeve, and whose closed end face 32 coincides with the face bounded by the edge 33 of the open end of the screw cap.

When in the assembly shown in Fig. 4 a coaxial cable is inserted into the corresponding feed-through channel 25, through tightening of the screw cap on the screwed sleeve, the cable can be moved in the longitudinal direction of the housing under the effect of the pressure exerted through the pressure face 32 and the edge 33. First of all here, the conducting point 13 of the penetration pin penetrates into the insulating outer sheath 34 of the coaxial cable, shown in Fig. 5. Further tightening of the screw cap results in the point 13 successively penetrating through the outer conductor 35 and the insulating inner sheath 36 to the inner conductor 37 of the coaxial cable. After some time the teeth 5 also penetrate into the outer sheath, the outer conductor and the inner sheath.

If it is now ensured that the distance between the pointed end 6 of the tooth 5 and the base of the point 13 is greater than the thickness of the outer conductor 35 of the coaxial cable to be contacted, the point 13 and the tooth 5 cannot make contact simultaneously with the outer conductor, so that short-circuiting of the tooth and the penetration pin is prevented. In the final situation shown in Fig. 5 the cable sits, under the influence of the clamping action of the screwed sleeve and the screw cap, firmly retained in the feed-through channel 25.

It will be clear that the cable is both contacted and clamped in the feed-through channel in one operation, namely tightening of the screw cap on the screwed sleeve. Through the pressure element 31 and the shape of the feed-through channel 25 corresponding to the round cable and the curved supporting face 24 in the screwed sleeve 19, the cable is prevented from being deformed during the contacting, in such a way that the conducting point

13 of the penetration pin does not penetrate radially into the cable and consequently will not make contact with the inner conductor 37 of the cable.

The screwed sleeve and the screw cap are provided with external ridges 38, 39 respectively, in order to have sufficient grip for fixing the screw cap on the screwed sleeve by hand. The screw cap and the screwed sleeve can be made of either metal or (injection-moulded) plastic.

The teeth 5 of the housing must be sufficiently rigid to be able to penetrate without deformation through the insulating outer sheath 34 and the outer conductor 35 -generally made up of a braided wire screen and/ or a thin copper foil- of the coaxial cable. Making the tip 13 of the penetration pin pointed means that both coaxial cables with a solid inner conductor 37 and also an inner conductor 37 consisting of stranded wires can be contacted. Of course, the penetration pin must also have sufficient rigidity to enable it to pass through the cable without deformation.

Fig. 6 illustrates how the penetration pin 12, the socket 16 and the supporting disc 15 are connected together in the preferred embodiment of the present invention. In the carrier strip 40 of electrically conducting material an opening 41 is provided in such a way that lips 42 which are bent from the position shown by the dotted line perpendicular to the plane of the drawing in Fig. 6a are thereby formed. The electrically conducting penetration pin 12 is clamped between these bent-over lips 42 at a distance from the carrier strip 40. The socket 16, the development 43 of which is shown by dotted lines in Fig. 6a, is fixed with the lips 44 - bent inwards perpendicular to the plane of the drawing - on the end opposite the pointed end 13 of the penetration pin around the latter. Fig. 6b shows the top view of the system thus formed, seen from the point 13 of the penetration pin.

Subsequently, by means of, for example an injection-moulding process, the supporting disc 15 is formed round the penetration pin and part of the socket 16, as shown in Fig. 6c. Material of the supporting disc penetrates in the process into the opening 41 of the carrier strip and the holes 45 of the socket, which provides in an efficient manner a barrier against axial shifting of the socket and the penetration pin in the supporting disc. The whole is then separated from the adjacent carrier strips on either side at the level of the side faces 46 which were produced during formation of the supporting disc such that they lie inwards relative to the periphery thereof. The surfaces of fracture of the carrier strip are indicated by 47 (see also Fig. 1). The fact that the surfaces of fracture 47 lie inwards relative to the periphery of the supporting disc means that they are prevented in the mounted state from making electrical contact with the hous-

ing.

Fig. 7 shows another partially "cutaway" embodiment of the branch connector according to the invention. At one end of the cylindrical housing 48, as in the embodiment according to Fig. 1, provision is made for U-shaped notches which form a feed-through channel 49 with projecting teeth 72 therein. The supporting disc 50 with the penetration pin 51 projecting into the feed-through channel 49 is held clamped here between rows - displaced relative to each other in the longitudinal direction of the housing - of spring-loaded lips 52 projecting inwards radially along the periphery thereof and elevations 53. These lips and elevations are formed as bent-through parts of the cylindrical jacket of the housing. At the end of the housing 48 which is provided with the feed-through channel provision is made for short radially outward projecting lips 54. The penetration pin 51 is insulated in the same way as in Fig. 1 at the end which is to penetrate into the cable, and at the other end is provided with a socket 55. The screwed sleeve 56 is cylindrical in shape, with an internal diameter which is slightly larger than the external diameter of the housing 48. The screwed sleeve has at the end provided with the screw thread 59 a corresponding feed-through channel 57, formed by U-shaped notches, but without internal supporting surface 24 as in the embodiment according to Fig. 3. Provided on this same end internally in the longitudinal direction of the screwed sleeve around the periphery thereof are short grooves 58, of such dimensions that the lips 54 of the housing 48 fit into these grooves 58. These lips and grooves work together in such a way that when the screwed sleeve is slid over the housing, from the end of the housing not provided with the feed-through channel, the screwed sleeve is held and positioned in such a way that the feed-through channels 49 and 57 of housing 48 and screwed sleeve 56 respectively lie opposite each other and form a feed-through channel which is open for receiving the coaxial cable. The screw cap 60 is the same shape as the screw cap 20 according to the embodiment of Fig. 3, the diameter of the pressure element inside the screw cap 60 being such that the pressure element fits in the interior of the housing 48. A cable inserted in the feed-through channel is contacted in the same way as described in connection with the preferred embodiment of the invention. When the screw cap 60 is screwed onto the screwed sleeve 56, the latter is locked by means of the lips 54 and the grooves 58 against turning in the tangential direction.

A further embodiment of a branch connector according to the invention for contacting two separate coaxial cables is shown in perspective in Fig. 8. The other end of the housing is here also provided with a similar second feed-through chan-

nel 61 with tooth 62 and openings 67, as in the case of the branch connector with a single feed-through channel 4, tooth 5 and openings 8 in Fig. 1. The penetration pin 64 supported by the transverse supporting disc 63 is now formed in such a way that it has two pointed conducting points 65, 66, which each project into a feed-through channel at the two ends of the housing. The supporting disc 63 is locked in the housing in the same way as in the branch connector according to Fig. 1. The screwed sleeves 19 are locked to the housing in the same way as shown in Fig. 4.

A coaxial cable can now be inserted in both feed-through channels 4, 61, and is contacted in the same way as that described for the branch connector for a single cable. The fitted assembly of two of the same screwed sleeves 19 with the screw thread ends facing away from each other is shown in Fig. 9.

Fig. 10 shows how a branching can be achieved according to the invention with the branch connector built up in a simple and universal manner. The coaxial cable 68, designed for example as a ring circuit, is branched by means of a branch connector according to Fig. 8, while the cable 69 for connection is provided at the other end with a branch connector according to Fig. 3 or Fig. 7. This end can then be connected to a coaxial junction box of an apparatus to be connected.

It goes without saying that the invention is not restricted to the embodiments discussed above and shown in the figures, but that modifications and additions can be provided, for example in the numbers of teeth, the locking of the penetration pin in the housing, or the way in which the separate parts of the clamping element are connected together, for example instead of screw thread, by means of a "snap connection" etc., without going beyond the scope of the invention as defined in the appended claims.

Claims

1. A branch connector for coaxial cable (68;69) having at least one inner conductor (37) surrounded by an inner insulation sheath (36), said inner sheath (36) being surrounded by at least one outer conductor (35) and an outer insulation sheath (34) respectively, said branch connector comprising an elongated housing (1;48) of electrically conductive material, at least one end of which being provided with a feed-through channel (4;49;61) for receiving the coaxial cable (68;69) and at least one electrically conductive tooth (5;62;72) adapted for contacting the outer conductor (35) of the coaxial cable (68;69), an electrically conductive penetration pin (12;51;64) axially arranged in

the housing (1;48), said penetration pin (12;51;64) being electrically insulated from the housing (1;48), at least one end of said penetration pin (12;51;64) having a point (13;65;66) radially penetrating in said feed-through channel (4;49;61) and adapted for contacting the inner conductor (37) of the coaxial cable (68;69) and having an insulation sheath (14) for preventing electrical contact with the outer conductor (35) of the contacted coaxial cable (68;69), and at least one clamping element (19;20;56;60) for retaining the contacted coaxial cable (68;69) in said feed-through channel (4;49;61), characterized in that said housing (1;48) is circular cylindrical in shape, the penetration pin (12;51;64) is locked inside the housing (1;48) on a transverse supporting disc (15;50;63) of insulation material, while the at least one clamping element consist of a sleeve (19;56), having at one end thereof a feed-through channel (25;57) corresponding to the feed-through channel (4;49;61) of the cylindrical housing (1;48) and adapted to be fitted over the jacket of the cylindrical housing (1;48) such that said feed-through channels (4;49;61;25;57) are opposite each other to form one feed-through channel for receiving the coaxial cable (68;69), and a cap (20;60) for coupling with said sleeve (19;56) for contacting and firmly retaining the coaxial cable (68;69) in the one feed-through channel.

2. A branch connector according to claim 1, characterized in that said cap (20;60) is a screw cap having screw thread (21) and said sleeve (19;56) is a screwed sleeve having screw thread (22;59) at the end thereof provided with its feed-through channel (25;57), such that said screw cap and screwed sleeve form a screw coupling.
3. A branch connector according to claim 1 or 2, characterized in that the feed-through channel (4;49;61) of the housing (1;48) is accessible from said one end thereof, the at least one tooth (5;62;72) projects a distance less than the point (13;65;66) of the penetration pin (12;51;64) into the feed-through channel (4;49;61) of the housing (1;48), said feed-through channel (4;49;61) is defined by two approximately U-shaped notches (3) disposed diametrically opposite each other in the jacket of the cylindrical housing (1;48), on at least one narrow edge of said notches (3) said at least one tooth (5;62;72) is provided.
4. A branch connector according to claim 3, characterized in that an approximately U-shaped



nel 61 with tooth 62 and openings 67, as in the case of the branch connector with a single feed-through channel 4, tooth 5 and openings 8 in Fig. 1. The penetration pin 64 supported by the transverse supporting disc 63 is now formed in such a way that it has two pointed conducting points 65, 66, which each project into a feed-through channel at the two ends of the housing. The supporting disc 63 is locked in the housing in the same way as in the branch connector according to Fig. 1. The screwed sleeves 19 are locked to the housing in the same way as shown in Fig. 4.

A coaxial cable can now be inserted in both feed-through channels 4, 61, and is contacted in the same way as that described for the branch connector for a single cable. The fitted assembly of two of the same screwed sleeves 19 with the screw thread ends facing away from each other is shown in Fig. 9.

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It goes without saying that the invention is not restricted to the embodiments discussed above and shown in the figures, but that modifications and additions can be provided, for example in the numbers of teeth, the locking of the penetration pin in the housing, or the way in which the separate parts of the clamping element are connected together, for example instead of screw thread, by means of a "snap connection" etc., without going beyond the scope of the invention as defined in the appended claims.

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2. A branch connector according to claim 1, characterized in that said cap (20;60) is a screw cap having screw thread (21) and said sleeve (19;56) is a screwed sleeve having screw thread (22;59) at the end thereof provided with its feed-through channel (25;57), such that said screw cap and screwed sleeve form a screw coupling.
3. A branch connector according to claim 1 or 2, characterized in that the feed-through channel (4;49;61) of the housing (1;48) is accessible from said one end thereof, the at least one tooth (5;62;72) projects a distance less than the point (13;65;66) of the penetration pin (12;51;64) into the feed-through channel (4;49;61) of the housing (1;48), said feed-through channel (4;49;61) is defined by two approximately U-shaped notches (3) disposed diametrically opposite each other in the jacket of the cylindrical housing (1;48), on at least one narrow edge of said notches (3) said at least one tooth (5;62;72) is provided.
4. A branch connector according to claim 3, characterized in that an approximately U-shaped

supporting surface (24) is provided inside the sleeve (19), said U-shaped supporting surface (24) having openings (27;26) for feeding through the penetration pin (12;64) and the at least one tooth (5;62) respectively, said supporting surface (24) together with the U-shaped notches (23) in the sleeves (19) forming the feed-through channel (25) thereof.

5. A branch connector according to claim 1, 2, 3 or 4, characterized in that the housing (1;48) and the sleeve (19;56) are provided with means (8;67;28;54;58) for retaining and positioning the sleeve (19;56) with respect to the housing (1;48), in such a way that in the fitted state the one feed-through channel is open for receiving the coaxial cable (68;69).
6. A branch connector according to claim 5 dependent on claim 4, characterized in that at least one projecting trapezoidal boss (28) is provided internally along the periphery of the sleeve (19) between the end thereof not provided with its feed-through channel (25) and the convex side of the supporting surface (24), said at least one trapezoidal boss (28) being adapted to engage with at least one corresponding opening (8;67) of the housing (1) at the end thereof provided with its feed-through channel (4;61).
7. A branch connector according to one or more of the preceding claims, characterized in that a tubular pressure element (31) is provided concentrically inside the cap (20;60), said pressure element (31) being adapted to fit into the sleeve (19) or the housing (48), and one closed end face (32) of said pressure element (31) coincides with the open end of the cap (20;60).
8. A branch connector according to one or more of the preceding claims, characterized in that the penetration pin (12;51;64) is attached to a carrier strip (40) in which the insulation material of the transverse supporting disc (15;50;63) grips for the purpose of preventing axial and radial shifting of the penetration pin (12;51;64) within the supporting disc (15;50;63), and the end of said penetration pin (12;51;64) for penetrating into the coaxial cable (68;69) being enclosed over a part (14) by the insulation material of the supporting disc (15;50;63), in order to prevent electrical contact with the outer conductor (35) of the coaxial cable (68;69) to be contacted.
9. A branch connector according to one or more of the preceding claims, characterized in that

the housing (1;48) is provided with locking means (9;52;53) in order to prevent displacement of the penetration pin (12;51;64) in axial and tangential direction with respect to the housing (1;48), said locking means (9;52;53) are formed such that the supporting disc (15;50;63) with the penetration pin (12;51;64) is detachably locked inside the housing (1;48).

10. A branch connector according to claim 9, characterized in that the locking means includes at least one boss (17) which projects radially outwards on the periphery of the supporting disc (15;63) and is adapted to engage in at least one corresponding opening (9) provided in the jacket of the cylindrical housing (1).
11. A branch connector according to one or more of the preceding claims, characterized in that the other end of the conductive penetration pin (12;51;64) is designed as a socket (16;55), said socket (16;55) together with the other end of the circular cylindrical housing (1;48) not provided with its feed-through channel (4;49;61) forms a coaxial coupling socket.
12. A branch connector according to one or more of the claims 1 to 10, characterized in that the other end of the conductive penetration pin (12;51;64) is designed as a contact pin, and together with the other end of the circular cylindrical housing (1;48) not provided with its feed-through channel (4;49;61) forms a coaxial plug.
13. A branch connector according to one or more of the claims 1 to 10, characterized in that both ends of the housing (1) are provided with a feed-through channel (4;61), each of which having at least one tooth (5;62), both ends of the penetration pin (64) having a point (65;66) penetrating in a feed-through channel (4;61), wherein at each end of said housing (1) a sleeve (19) having a feed-through channel (25) is fitted, such that two feed-through channels are formed for receiving a coaxial cable (68;69), and in that for coupling with each sleeve (19) a cap (20;60) being provided.

Patentansprüche

1. Abzweigungsverbindung für Koaxialkabel (68; 69), welches wenigstens einen inneren Leiter (37) hat, welcher von einem inneren Isoliermantel (36) umgeben ist, der innere Mantel (36) von wenigstens einem äußeren Leiter (35) und einem äußeren Isoliermantel (34) jeweils umgeben ist, wobei die Abzweigungsverbindung



ein längliches Gehäuse (1; 48) aus elektrisch leitendem Material, von dem wenigstens ein Ende einen Durchführungs kanal (4; 49; 61) zur Aufnahme des Koaxialkabels (68; 69) und wenigstens einen elektrisch leitenden Zahn (5; 62; 72) aufweist, welcher derart ausgelegt ist, daß er den äußeren Leiter (35) des Koaxialkabels (68; 69) kontaktiert, ferner einen elektrisch leitenden Penetrationsstift (12; 51; 64) aufweist, welcher axial im Gehäuse (1; 48) angeordnet ist, wobei der Penetrationsstift (12; 51; 64) von dem Gehäuse (1; 48) elektrisch isoliert ist, wenigstens ein Ende des Penetrationsstiftes (12; 51; 64) eine Spitze (13; 65; 66) hat, welche radial in den Durchführungs kanal (4; 49; 61) eindringt, und derart ausgelegt ist, daß er den inneren Leiter (37) des Koaxialkabels (68; 69) kontaktiert, und einen Isoliermantel (14) zum Unterbinden eines elektrischen Kontakts mit dem äußeren Leiter (35) des kontaktierten Koaxialkabels (68; 69) hat, und welcher wenigstens ein Klemmelement (19; 20; 56; 60) zum Festlegen des kontaktierten Koaxialkabels (68; 69) in dem Durchführungs kanal (4; 49; 61) aufweist, dadurch gekennzeichnet, daß das Gehäuse (1; 48) hinsichtlich der Form kreiszylindrisch gestaltet ist, der Penetrationsstift (12; 51; 64) im Innern des Gehäuses (1; 48) auf einer Querstützscheibe (15; 50; 63) aus Isoliermaterial festgelegt ist, während das wenigstens eine Klemmelement eine Hülse (19; 56) umfaßt, welche an einem Ende einen Durchführungs kanal (25; 57) entsprechend dem Durchführungs kanal (4; 49; 61) des zylindrischen Gehäuses (1; 48) hat, und derart ausgelegt ist, daß sie passend über dem Mantel des zylindrischen Gehäuses (1; 48) derart anordenbar ist, daß die Durchführungs kanäle (4; 49; 61; 25; 57) derart einander gegenüberliegen, daß ein Durchführungs kanal zur Aufnahme des Koaxialkabels (68; 69) gebildet wird, und daß eine Kappe (20; 60) zur koppelnden Verbindung mit der Hülse (19; 56) vorgesehen ist, um das Koaxialkabel (68; 69) in dem Durchführungs kanal zu kontaktieren und festzulegen.

2. Abzweigungsverbindung nach Anspruch 1, dadurch gekennzeichnet, daß die Kappe (20; 60) eine Schraubkappe ist, welche ein Schraubgewinde (21) hat, und die Hülse (19; 56) ein Schraubhülse ist, welche ein Schraubgewinde (22; 59) hat, an deren Ende der Durchführungs kanal (25; 57) vorgesehen ist, derart daß die Schraubkappe und die Schraubhülse eine Schraubkopplungsverbindung bilden.

3. Abzweigungsverbindung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Durchführungs kanal (4; 49; 61) des Gehäuses (1; 48)

von dem einen Ende her zugänglich ist, der wenigstens einen Zahn (5; 62; 72) um eine Strecke in den Durchführungs kanal (4; 49; 61) des Gehäuses (1; 48) vorsteht, welche kleiner als die Spitze (13; 65; 66) des Penetrationsstiftes (12; 51; 64) ist, der Durchführungs kanal (4; 49; 61) von zwei etwa U-förmigen Ausnehmungen (3) gebildet wird, welche diametral gegenüberliegend zueinander im Mantel des zylindrischen Gehäuses (1; 48) angeordnet sind, und daß auf wenigstens einer schmalen Kante der Ausnehmungen (3) der wenigstens eine Zahn (5; 62; 72) vorgesehen ist.

4. Abzweigungsverbindung nach Anspruch 3, dadurch gekennzeichnet, daß eine etwa U-förmige Stützfläche (24) im Innern der Hülse (19) vorgesehen ist, die U-förmige Stützfläche (24) Öffnungen (27; 26) zur Durchführung des Penetrationsstiftes (12; 64) und des wenigstens einen Zahnes (5; 62) jeweils hat, und daß die Stützfläche (24) zusammen mit den U-förmigen Ausnehmungen (23) in der Hülse (19) den Durchführungs kanal (25) derselben bilden.

5. Abzweigungsverbindung nach Anspruch 1, 2, 3 oder 4, dadurch gekennzeichnet, daß das Gehäuse (1; 48) und die Hülse (19; 56) mit Einrichtungen (8; 67; 28; 54; 58) zum Festhalten und Positionieren der Hülse (19; 56) bezüglich des Gehäuses (1; 48) dergestalt versehen sind, daß im Paßzustand der eine Durchführungs kanal zur Aufnahme des Koaxialkabels (68; 69) offen ist.

6. Abzweigungsverbindung nach Anspruch 5, in Abhängigkeit von Anspruch 4, dadurch gekennzeichnet, daß wenigstens ein vorstehender, trapezförmiger Vorsprung (28) im Innern längs des Umfanges der Hülse (19) zwischen dem Ende derselben, welches nicht mit dem Durchführungs kanal (25) versehen ist, und der konvexen Seite der Stützfläche (24) vorgesehen ist, und daß der wenigstens eine trapezförmige Vorsprung (28) derart beschaffen und ausgelegt ist, daß er mit wenigstens einer zugeordneten Öffnung (8; 67) des Gehäuses (1) zusammenarbeitet, an dessen Ende der Durchführungs kanal (4; 61) vorgesehen ist.

7. Abzweigungsverbindung nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß ein rohrförmiges Druckelement (31) konzentrisch im Innern der Kappe (20; 60) vorgesehen ist, und daß das Druckelement (31) derart beschaffen und ausgelegt ist, daß es in die Hülse (19) oder das





Gehäuse (48) paßt und eine geschlossene Endfläche (32) des Druckelements (31) mit dem offenen Ende der Kappe (20; 60) zusammenfällt.

8. Abzweigungsverbindung nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Penetrationsstift (12; 51; 64) an einem Trägerstreifen (40) angebracht ist, in welchem das Isolationsmaterial der Querstützscheibe (15; 50; 63) zum Zwecke des Verhinderns einer axialen und radialen Verschiebung des Penetrationsstiftes (12; 51; 64) in der Stützscheibe (15; 50; 60) ergriffen wird, und daß das Ende des Penetrationsstiftes (12; 51; 64) zum Eindringen in das Koaxialkabel (68; 69) über einem Teil (14) durch das Isoliermaterial der Stützscheibe (15; 50; 63) umschlossen ist, um einen elektrischen Kontakt mit dem äußeren Leiter (35) des zu kontaktierenden Koaxialkabels (68; 69) zu verhindern.
9. Abzweigungsverbindung nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das Gehäuse (1; 48) mit Sperreinrichtungen (9; 52; 53) versehen ist, um eine Verschiebung des Penetrationsstiftes (12; 51; 64) in axialer und tangentialer Richtung bezüglich des Gehäuses (1; 48) zu verhindern, wobei die Sperreinrichtungen (9; 52; 53) derart ausgebildet sind, daß die Stützscheibe (15; 50; 63) mit dem Penetrationsstift (12; 51; 64) im Innern des Gehäuses (1; 48) lösbar gesichert ist.
10. Abzweigungsverbindung nach Anspruch 9, dadurch gekennzeichnet, daß die Sperreinrichtungen wenigstens einen Vorsprung (17) umfassen, welcher radial auf dem Umfang der Stützscheibe (15; 63) nach außen vorsteht und derart beschaffen und ausgelegt ist, daß er in wenigstens eine zugeordnete Öffnung (9) eingreift, welche im Mantel des zylindrischen Gehäuses (1) vorgesehen ist.
11. Abzweigungsverbindung nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das andere Ende des leitenden Penetrationsstiftes (12; 51; 64) als ein Buchseteil (16; 55) ausgelegt ist, und daß das Buchseil (16; 55) zusammen mit dem anderen Ende des kreiszylindrischen Gehäuses (1; 48), welches nicht mit dem Durchführungs kanal (4; 49; 61) versehen ist, ein Koaxialverbindungs buchseteil bildet.
12. Abzweigungsverbindung nach einem oder

mehreren Ansprüchen 1 bis 10, dadurch gekennzeichnet, daß das andere Ende des leitenden Penetrationsstiftes (12; 51; 64) als ein Kontaktstift ausgelegt ist und zusammen mit dem anderen Ende des kreiszylindrischen Gehäuses (1; 48), welches nicht mit dem Durchführungs kanal (4; 49; 61) versehen ist, einen Koaxialstecker bildet.

13. Abzweigungsverbindung nach einem oder mehreren der Ansprüche 1 bis 10, dadurch gekennzeichnet, daß beide Enden des Gehäuses (1) mit einem Durchführungs kanal (4; 61) versehen sind, von denen jeder wenigstens einen Zahn (5; 62) hat, beide Enden des Penetrationsstiftes (64) eine Spitze (65; 66) haben, welche in einen Durchführungs kanal (4; 61) eindringt, und daß an jedem Ende des Gehäuses (1) eine Hülse (19), welche einen Durchführungs kanal (25) hat, passend derart vorgesehen ist, daß zwei Durchführungs kanäle zur Aufnahme eines Koaxialkabels (68; 69) gebildet werden, und daß zur Verbindung mit der jeweiligen Hülse (19) eine Kappe (20; 60) vorgesehen ist.

Revendications

1. Connecteur de dérivation pour câble coaxial (68; 69), présentant au moins un conducteur intérieur (37) entouré d'une gaine isolante intérieure (36), ladite gaine intérieure (36) étant entourée respectivement par au moins un conducteur extérieur (35) et une gaine isolante extérieure (34), ledit connecteur de dérivation comprenant un boîtier allongé (1; 48) en matériau conducteur de l'électricité, dont au moins une extrémité est pourvue d'un canal de traversée (4; 49; 61) pour loger le câble coaxial (68; 69) et au moins une dent (5; 62; 72) conductrice de l'électricité, adaptée pour venir en contact avec le conducteur extérieur (35) du câble coaxial (68; 69), une broche de pénétration (12; 51; 64) conductrice de l'électricité, disposée axialement dans le boîtier (1; 48), ladite broche de pénétration (12; 51; 64) étant isolée électriquement du boîtier (1; 48), au moins une extrémité de ladite broche de pénétration (12; 51; 64) présentant une pointe (13; 65; 66) pénétrant radialement dans ledit canal de traversée (4; 49; 61), et adaptée pour venir en contact avec le conducteur intérieur (37) du câble coaxial (68; 69) et présentant une gaine isolante (14), pour empêcher un contact électrique avec le conducteur extérieur (35) du câble coaxial (68; 69) mis en contact, et au moins un élément de serrage (19, 20; 56, 60) pour maintenir le câble coaxial (68; 69) mis en

contact dans ledit canal de traversée (4; 49; 61), caractérisé en ce que ledit boîtier (1; 48) est de forme cylindrique circulaire, la broche de pénétration (12; 51; 64) est verrouillée à l'intérieur du boîtier (1; 48), sur un disque de support transversal (15; 50; 63) en matériau isolant, tandis que le au moins un élément de serrage consiste en un manchon (19; 56), présentant, à une de ses extrémités, un canal de traversée (25; 57) correspondant au canal de traversée (4; 49; 61) du boîtier cylindrique (1; 48), le manchon étant conçu pour s'adapter sur l'enveloppe du boîtier cylindrique (1; 48) de sorte que lesdits canaux de traversée (4; 49; 61; 25; 57) sont opposés l'un par rapport à l'autre, afin de former un canal unique de traversée pour loger le câble coaxial (68; 69), et un capuchon (20; 60) à accoupler audit manchon (19; 56), pour venir en contact avec, et maintenir fermement le câble coaxial (68; 69) dans le canal unique de traversée.

2. Connecteur de dérivation selon la revendication 1, caractérisé en ce que ledit capuchon (20; 60) est un capuchon fileté présentant un filetage (21) et ledit manchon (19; 56) est un manchon taraudé présentant un taraudage (22; 59), à son extrémité qui est pourvue de son canal de traversée (25; 57), de sorte que ledit capuchon fileté et le manchon taraudé forment un raccord à vis.

3. Connecteur de dérivation selon la revendication 1 ou 2, caractérisé en ce que le canal de traversée (4; 49; 61) du boîtier (1; 48) est accessible depuis sa dite extrémité, la au moins une dent (5; 62; 72) fait saillie sur une distance inférieure à la valeur de la pointe (13; 65; 66) de la broche de pénétration (12; 51; 64) introduite dans le canal de traversée (4; 49; 61) du boîtier (1; 48), ledit canal de traversée (4; 49; 61) étant défini par deux entailles (3) approximativement en forme de U, disposées de façon diamétralement opposée l'une par rapport à l'autre, dans l'enveloppe du boîtier cylindrique (1; 48), ladite au moins une dent (5; 62; 72) étant prévue sur au moins un bord étroit desdites entailles (3).

4. Connecteur de dérivation selon la revendication 3, caractérisé en ce qu'une surface de support (24) approximativement en forme de U est prévue à l'intérieur du manchon (19), ladite surface de support en forme de U (24) présentant des ouvertures (27; 26) pour le passage de la traversée, respectivement, de la broche de pénétration (12; 64) et de la au moins une dent (5; 62), ladite surface de support (24),

conjointement avec les entailles en forme de U (23) ménagées dans les manchons (19), formant le canal de traversée (25) de ce dernier.

5. Connecteur de dérivation selon la revendication 1, 2, 3 ou 4, caractérisé en ce que le boîtier (1; 48) et le manchon (19; 56) sont pourvus de moyens (8; 67; 28; 54; 58) pour maintenir et positionner le manchon (19; 56), par rapport au boîtier (1; 48), de manière qu'à l'état installé, le canal unique de traversée soit ouvert pour loger le câble coaxial (68; 69).

6. Connecteur de dérivation selon la revendication 5, en fonction de la revendication 4, caractérisé en ce qu'au moins un bossage trapézoïdal saillant (28) est prévu intérieurement, le long de la périphérie du manchon (19), entre l'extrémité de ce dernier, qui n'est pas pourvue de son canal de traversée (25), et le côté convexe de la surface de support (24), ledit au moins un bossage trapézoïdal (28) étant adapté pour s'introduire dans au moins une ouverture (8; 67) correspondante du boîtier (1), à l'extrémité de ce dernier, qui est pourvue de son canal de traversée (4; 61).

7. Connecteur de dérivation selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'un élément de pression tubulaire (31) est prévu de façon concentrique, à l'intérieur du capuchon (20; 60), ledit élément de pression (31) étant adapté pour s'installer dans le manchon (19) ou le boîtier (48), et une face d'extrémité fermée (32) dudit élément de pression (31) coïncide avec l'extrémité ouverte du capuchon (20; 60).

8. Connecteur de dérivation selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'une broche de pénétration (12; 51; 64) est fixée à une bande porteuse (40), dans laquelle le matériau isolant du disque de support transversal (15; 50; 63) réalise un effet de serrage, afin d'empêcher un déplacement axial et radial de la broche de pénétration (12; 51; 64), à l'intérieur du disque de support (15; 50; 63), et l'extrémité de ladite broche de pénétration (12; 51; 64), pour pénétration dans le câble coaxial (68; 69), étant enfermée sur une partie (14) par le matériau isolant du disque de support (15; 50; 63), afin d'empêcher un contact électrique avec le conducteur extérieur (35) du câble coaxial (68; 69) à mettre en contact.

9. Connecteur de dérivation selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'un élément de pression tubulaire (31) est prévu de façon concentrique, à l'intérieur du capuchon (20; 60), ledit élément de pression (31) étant adapté pour s'installer dans le manchon (19) ou le boîtier (48), et une face d'extrémité fermée (32) dudit élément de pression (31) coïncide avec l'extrémité ouverte du capuchon (20; 60).



térisé en ce que le boîtier (1; 48) est pourvu de moyens de verrouillage (9; 52, 53), afin d'empêcher le déplacement de la broche de pénétration (12; 51; 64), dans la direction axiale et tangentielle, par rapport au boîtier (1; 48), lesdits moyens de verrouillage (9; 52, 53) sont formés de manière que le disque de support (15; 50; 63) pourvu de la broche de pénétration (12; 51; 64) soit verrouillé de façon démontable, à l'intérieur du boîtier (1; 48).

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10. Connecteur de dérivation selon la revendication 9, caractérisé en ce que le moyen de verrouillage comprend au moins un bossage (17), qui fait saillie radialement vers l'extérieur, sur la périphérie du disque de support (15; 63) et est adapté pour s'introduire dans au moins une ouverture (9) correspondante, ménagée dans l'enveloppe du boîtier cylindrique (1).

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11. Connecteur de dérivation selon une ou plusieurs des revendications précédentes, caractérisé en ce que l'autre extrémité de la broche de pénétration conductrice (12; 51; 64) est conçue comme une douille (16; 55), et cette douille (16; 55), conjointement avec l'autre extrémité du boîtier cylindrique circulaire (1; 48), non pourvue de son canal de traversée (4; 49; 61), forme une douille de couplage coaxial.

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12. Connecteur de dérivation selon une ou plusieurs des revendications 1 à 10, caractérisé en ce que l'autre extrémité de la broche de pénétration conductrice (12; 51; 64) est conçue comme une broche à contact et, conjointement avec l'autre extrémité du boîtier cylindrique circulaire (1; 48), non pourvue de son canal de traversée (4; 49; 61), forme une fiche coaxiale.

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13. Connecteur de dérivation selon une ou plusieurs des revendications 1 à 10, caractérisé en ce que les deux extrémités du boîtier (1) sont pourvues d'un canal de traversée (4; 61), présentant chacun au moins une dent (5; 62), les deux extrémités de la broche de pénétration (64) présentant une pointe (65; 66) pénétrant dans un canal de traversée (4; 61), dans lequel, à chaque extrémité dudit boîtier (1), est installé un manchon (19) présentant un canal de traversée (25), de sorte que deux canaux de traversée sont formés pour loger un câble coaxial (68; 69) et en ce qu'un capuchon (20; 60) est prévu pour l'accouplement à chaque manchon (19).

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