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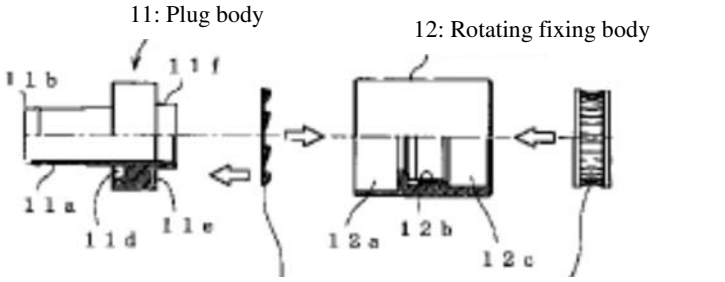
(54) [Title of the Invention]
A Coaxial Plug

(57) [Abstract]
[Problems] To prevent deterioration in insertion loss characteristic and reflection loss characteristics, even in state of loss coaxial plug.
[Solutions]: A disc-shaped spring 13 is accommodated in a spring housing groove 11e of a plug body 11, and accommodated in a rotary mounting element 12. Thereby, a ring-shaped part 11c is accommodated in the main body accommodation part 12a. By conducting curling processing with curling processed part 11f, the rotary mounting element is fixed to the plug body in a rotatable manner 11. A ring-shaped spring 14 is accommodated in a spring housing part 12c of the rotary mounting element 12. Thereby, the electrical connection of the plug body 11 and the rotary mounting element 12 is conducted with the disc-shaped spring 13 existing between them, and the electrical connection of the rotary mounting element 12 and a coaxial connector is conducted with the ring-shaped spring 14 existing between them.



[Scope of Claims]
[Claim 1]
A coaxial plug is installed at the tip of a coaxial cable comprising of a ring-shaped part; a cylindrically–shaped curled part protrudes from one surface of the ring-shaped part; the plug body formed as a protrusion from the other surface of the aforementioned ring-shaped part, with a cable-insertion part, can be inserted between the internal insulator of said coaxial cable and the braided wire; a disc-shaped spring accommodated in the spring–housing groove located on one surface of said ring-shaped part; a rotary engagement part forms an almost cylindrical shape which protrudes inside the center part of the inner circumferential surface and the threaded mounting section; a rotary mounting element with a main body accommodation part wherein said ring-shaped part is accommodated at one end of the inner circumferential surface, with a spring–housing part formed at the other end as part of the inner circumferential surface; a ring-shaped spring accommodated within said spring–housing part: said curled part, post-curling processing, is engaged with said rotary engagement part in a rotatable manner, such that said rotary mounting element can rotate relative to said plug body.
[Claim 2]
The coaxial plug as in Claim 1 wherein said ring–shaped spring is formed by bending a band-shaped elastic metal plate into a ring shape.
[Claim 3]
A coaxial plug is installed at the tip of the coaxial cable comprising of a ring-shaped part; a cylindrically–shaped curled part protruding from one surface of the ring-shaped part; a plug body formed as a protrusion from the other surface of the aforementioned ring-shaped part, with a cable insertion part that can be inserted between the internal insulator of said coaxial cable and the braided wire; a rotary engagement part that forms an almost cylindrical shape which protrudes inside the center part of the inner circumferential surface and the threaded mounting section; a rotary mounting element with a main body accommodation part formed at one end of the inner circumferential surface, with the spring–housing part formed at the other end as part of the inner circumferential surface; a first ring-shaped spring accommodated within said main body accommodation part and inserted in said ring-shaped part; and the second ring-shaped spring accommodated within said spring–housing part: said curled part, post-curling processing, is engaged with said rotary engagement part in a rotatable manner, such that said rotary mounting element can rotate relative to said plug body.
[Claim 4]
The coaxial plug as in Claim 1 or Claim 3 wherein a stopper protrusion for stopping the spring contained in said spring housing part is formed at the tip of said spring housing part.
[Claim 5]
A coaxial plug is installed at the tip of the coaxial cable comprising a ring-shaped part; a cylindrically–shaped curled part protruded from one surface of the ring-shaped part; a plug body formed as a protrusion from the other surface of the aforementioned ring-shaped part, with a cable insertion part that can be inserted between the internal insulator of said coaxial cable and the braided wire; a rotary engagement part that forms an almost cylindrical shape which protrudes inside the center part of the inner circumferential surface and the spring housing part; a rotary mounting element with a main body accommodation part formed at one end of the inner circumferential surface, with the threaded mounting section formed at the other end part of the inner circumferential surface; a first ring-shaped spring accommodated within said main body accommodation part and inserted in said ring-shaped part; and the second ring-shaped spring accommodated within said spring–housing part: said curled part, post-curling processing, is engaged with said rotary engagement part in a rotatable manner, such that said rotary mounting element can rotate relative to said plug body.
[Claim 6]
The coaxial plug as in Claim 3 or Claim 5 wherein said ring-shaped spring is formed by bending a band-shaped elastic metal plate in a ring shape
[Detailed Description of the Invention]
[0001]
[Technical Field of the Invention] The present invention relates to a coaxial plug installed at the tip of a coaxial cable.
[0002]
[Prior Art] In reception devices such as television satellite broadcasting tuners, a coaxial connector is installed and reception signals are inputted by fixing a coaxial plug installed at the tip of the coaxial cable to this coaxial connector. Fig. 34 shows the constitution of a conventional coaxial plug installed at the tip of a coaxial cable.
[0003]
The coaxial plug 300 shown in Fig. 34 comprises of a plug body 311 and a rotary mounting element 312 fixed in a rotatable manner to the plug body 311. The rotary mounting element 312 consists of hexagonally–shaped nuts and a female screw thread cut on the internal circumferential surface to be screwed together with a coaxial connector. The plug body 311 is equipped with a ring–shaped part 311c, protruding part 311f supporting a rotary mounting element 312 in a rotatable manner which protrudes from one surface of ring–shaped part 311c, and a cable–insertion part 311that protrudes from the other surface of the ring–shaped part 311c. The cable insertion part 311a is to be inserted between the internal insulator of the coaxial cable and the braided wire; the stopper part 311b has a cross-sectional saw tooth shape formed at its tip and does not protrude from the coaxial cable.
[0004]
In order to install coaxial plug 300 into the coaxial cable, first an sheath at the tip of the coaxial cable is removed so that the internal insulator is exposed to the desired length. Further, the core wire is exposed to the desired length by removing the internal insulator.

The core wire processed in the coaxial cable and internal insulator are inserted from the back end of the cable insertion part 311a of the plug body 311 such that the core wire is arranged almost at the center of the rotary mounting element 312. In this case, the cable insertion part 311a is inserted between the internal insulator of the coaxial cable and the braided wire such that the tip of the sheath of the coaxial cable is in contact with the interior of the cable contacting groove 311d formed on the other surface of the ring-shaped part 311c. In this state, a caulking ring 302 is positioned in the coaxial cable located between the ring-shaped part 311c and the stopper part 311b to process caulking on the caulking ring 302. By so doing, the coaxial cable is caulked into the cable insertion part 311a by the caulking ring 302 and the stopper part 311b is fixed not coming out of the coaxial cable.
[0005]
[Problems to be Solved by the Invention]
The traditional coaxial plug 300 installed at the tip of the coaxial cable is fixed at the coaxial connector by bolting the rotary mounting element 312 into the coaxial connector. In this case in the prior coaxial plug 300, the tip of the protruded part 311f is brought into contact with the tip of the coaxial connector such that the braided wire constituting the grounded coaxial cable is connected to the coaxial connector. The shell of the coaxial connector brought into contact constitutes the grounding. However, the screw connection may be loosened due to various causes. For example, in the coaxial plug 300, the rotary mounting element 312 may be loosened relative to the shell of the coaxial connector. In this case, the contact between the tip of the protruded part 311f and the shell of the coaxial connector is released such that connection due to the contact is lost between the two parts. Thus, it is grounded by connecting to the braided wire via the rotary mounting element 312 and the plug body 311 that are screwed into the coaxial connector. However, the rotary mounting element 312 is fixed in a rotatable manner to the plug body 311 so that there is a gap between the two parts to be rotatable. The problem is that the connection between the rotary mounting element 312 and the plug body 311 becomes incomplete due to the presence of this gap. If the connection between the rotary mounting element 312 and the plug body 311 becomes incomplete, the connection between the braided wire of the coaxial cable and the shell of the coaxial connector becomes incomplete so that the insertion loss characteristics and the reflection loss characteristics of the coaxial plug 300 are deteriorated and there is a problem of causing troubles of receiving signals.
[0006]
This mode will be explained with reference to the graphs shown in Fig. 35 through 38. Fig. 35 shows the insertion loss characteristics in the case when the coaxial plug 300 is securely screwed in the coaxial connector. With reference to this figure, the insertion loss becomes approximately 0.5dB or less over a broad band area of 2.5GHz, indicating satisfactory characteristics. Further, Fig. 36 shows the reflection loss characteristics in the case when the coaxial plug 300 is securely screwed into the coaxial connector. With reference to this figure, the reflection loss over a broad band of 2.5GHz was approximately 23dB or greater, indicating satisfactory characteristics. Next, the insertion loss characteristics in the case when the coaxial plug 300 is fixed while the coaxial connector is loosened once are shown in Fig. 37. With reference to this figure, the insertion loss was significantly deteriorated in a lower frequency band area up to 0.5GHz. Further, Fig. 38 shows the reflection loss characteristics in the case when the coaxial plug 300 is fixed while the coaxial connector is loosened once. With reference to this figure, it is clearly shown that the reflection loss was significantly deteriorated over a frequency band area up to approximately 1.5GHz.
[0007]
Thus, the objective of the present invention is to provide a coaxial plug without deterioration of insertion loss characteristics and reflection loss characteristics even in the state when the coaxial plug is loosened.
[0008]
[Means for Solving the Problems]
The inventors earnestly investigated in order to achieve the aforementioned objective. The first coaxial plug of this invention is a coaxial plug installed at the tip of the coaxial cable and comprises a ring-shaped part; a cylindrically–shaped curled part protruded from one surface of the ring-shaped part; a plug body formed as protruded from the other surface of the aforementioned ring-shaped part having a cable insertion part that can be inserted between the internal insulator of said coaxial cable and the braided wire; a disc-shaped spring accommodated in the spring – housing groove formed on one surface of said ring-shaped part; a rotary engagement part formed almost in a cylindrical shape which is protruded interior almost at the center part of the inner circumferential surface and its threaded mounting section; a main body accommodation part wherein said ring-shaped part formed at one end of the inner circumferential surface is accommodated; a rotary mounting element having the spring – housing part formed at the other end part of the inner circumferential surface; and a ring-shaped spring accommodated within said spring – housing part. The said curled part after curling processing is engaged in a rotatable manner with said rotary engaging part such that said rotary mounting element is rotatable relative to said plug body. Further, in the first coaxial plug of the present invention, said ring-shaped spring can be formed by bending an elastic band-shaped metallic plate into a ring shape.
[0009]
Further, the second coaxial plug of this invention that can achieve the aforementioned objective is a coaxial plug installed at the tip of the coaxial cable which comprises a ring-shaped part; a cylindrically–shaped curled part protruded from one surface of the ring-shaped part; a plug body formed as protruded from the other surface of the aforementioned ring-shaped part having a cable insertion part that can be inserted between the internal insulator of said coaxial cable and the braided wire; a rotary engagement part formed almost in a cylindrical shape which is protruded interior almost at the center part of the inner circumferential surface and its threaded mounting section; a main body accommodation part formed at one end of the inner circumferential surface; a rotary mounting element having the spring–housing part formed at the other end part of the inner circumferential surface; a first ring-shaped spring accommodated within said main body accommodation part in a state inserted in said ring-shaped part; and the second ring-shaped spring accommodated within said spring–housing part. The said

curled part after curling processing is engaged in a rotatable manner with said rotary engaging part such that said rotary mounting element is rotatable relative to said plug body. Further, in the first coaxial plug or in the second coaxial plug of the present invention, the stopper protrusion stopped by the spring accommodated in said spring–housing part can be formed at the tip of said spring–housing part.
[0010]
Further, the third coaxial plug of this invention that can achieve the aforementioned objective is a coaxial plug installed at the tip of the coaxial cable which comprises a ring-shaped part; a cylindrically–shaped curled part protruded from one surface of the ring-shaped part; a plug body formed as protruded from the other surface of the aforementioned ring-shaped part having a cable insertion part that can be inserted between the internal insulator of said coaxial cable and the braided wire; a rotary engagement part formed almost in a cylindrical shape which is protruded interior almost at the center part of the inner circumferential surface and its spring–housing part; a rotary mounting element having the main body accommodation part formed at one end of the inner circumferential surface and the spring–housing part formed at the other end part of the inner circumferential surface; a first ring-shaped spring accommodated within said main body accommodation part in a state inserted in said ring-shaped part; and the second ring-shaped spring accommodated within said spring–housing part. The said curled part after curling processing is engaged in a rotatable manner with said rotary engaging part such that said rotary mounting element is rotatable relative to said plug body. Further, in the second coaxial plug or the third coaxial plug of the present invention, said ring-shaped spring can be formed by bending an elastic band–shaped metallic plate into a ring shape.
[0011]
According to this invention, using a disc-shaped spring or a ring-shaped spring, the plug body and the rotary mounting element are connected and the rotary mounting element and the coaxial connector as the subject to be fixed are connected using a ring-shaped spring so that even if the rotary mounting element is loosened, it prevents connection of grounding from becoming incomplete. For this reason, even if the coaxial plug is loosened from the coaxial connector, the electrical characteristics of the coaxial plug are not deteriorated. In this manner, it can prevent connection of grounding from becoming incomplete in a simple configuration by using a disc-shaped spring and a ring-shaped spring or using two ring-shaped springs. Therefore, this can prevent elevation of cost as possible. Further, since the total length of the rotary mounting element becomes longer, it becomes easier to operate the rotary mounting element with fingers. As a result, a coaxial plug can be easily fixed in the coaxial connector which has been embedded in the wall.
[0012]
[Mode to Carry-out the Invention]
Fig. 1 shows a first configuration example of the mode of operation of the coaxial plug of this invention and Fig. 2 shows disassembled assembly diagram. Fig. 3 shows a cross-sectional view when a coaxial plug in the first embodiment of the present invention is securely installed in the coaxial connector. Fig. 4 shows a cross-sectional view when installed loosely. Further, Fig. 5 through Fig. 8 show configurations of various parts of the coaxial plug in the first embodiment of the present invention.
[0013]
As shown in Fig. 1, the first coaxial plug in the embodiment of the present invention comprises a plug body 11 and a rotary mounting element 12 which is fixed in a rotatable manner to the plug body 11. A plug body 11 made of metals comprises a ring-shaped part 11c formed in a ring shape as shown in Fig. 2 through Fig. 5, a curled part 11f supporting a rotary mounting element in a rotatable manner 12 protruded from one surface of the ring-shaped part 11c, and a cable insertion part 11a protruded from the other surface of the ring-shaped part 11c. Further, a through-hole is formed through the plug body 11 almost along the central axis. Furthermore, the cable insertion part 11a is tapered towards the tip so that it forms a portion to be inserted between the internal insulator of the coaxial cable and the braided wire. At the tip of the cable insertion part 11a, a stopper part 11b having a cross-sectional saw tooth shape is formed in a ring–shape to
prevent it from coming out of the coaxial cable. In this case, on one side of the ring-shaped part 11c, a spring housing groove 11e is formed to contain a disc-shaped spring 13 formed in a disc shape. In contrast, a cable contact groove 11d is formed at the other surface of the ring-shaped part 11c where the tip of the coaxial cable installed becomes in contact.
[0014]
The rotary mounting element 12 made of metals is shaped in a cylindrical form and rollet processing is applied on the other circumference for preventing from slipping. As shown in Fig. 2 and Fig. 6, a threaded mounting section 12b is cut to be screwed into the coaxial connector almost in the central portion on the inner circumferential surface of the rotary mounting element 12. Further, a main body accommodation part 12a is formed at one end of the inner circumferential surface of the rotary mounting element 12 to contain a ring-shaped part 11c of the plug body 11. A rotary engagement part 12d is formed protruded inwardly between the main body accommodation part 12a and the threaded mounting section 12b. This rotary engagement part 12d is a part to be engaged with the curled processed part 11f in a rotatable manner when the curled processed part 11f of the plug body 11 is processed by curling. Further, a ring-shaped spring 14 formed in a ring form is accommodated at the other end of the inner circumferential surface of the rotary mounting element 12. A latching protrusion 12e is formed in a ring form at the tip of the spring housing part 12c in order to prevent the ring-shaped spring from slipping off.
[0015]
In addition, the ring-shaped part 11c is inserted into the main body accommodation part 12a by inserting it from the side of the curled processed part 11f to the rotary mounting element 12 while a disc-shaped spring 13 is accommodated in the spring housing groove 11e of the plug body 11 in the state shown in Fig. 2 and Fig. 5. If curling is applied to curl outwardly from the curling processed part 11f in this state, the curled part 11f after curling is engaged with the rotary engagement part 12d in a rotatable manner as shown in Fig. 3 and Fig. 4. Subsequently, a coaxial plug 1 can be assembled by installing the ring-shaped spring 14 into the spring housing part 12c of the rotary mounting element 12.

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