

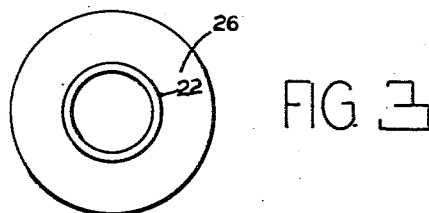
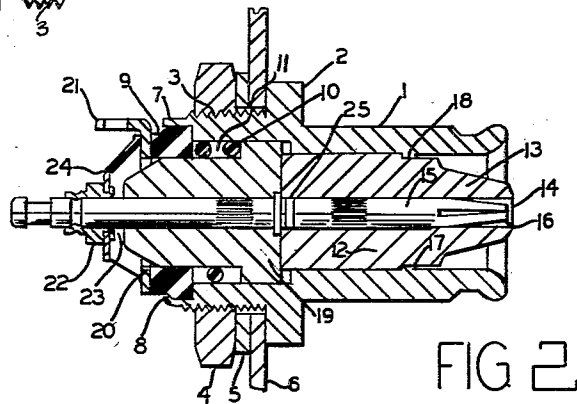
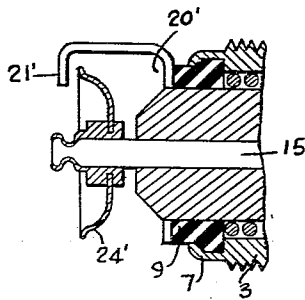
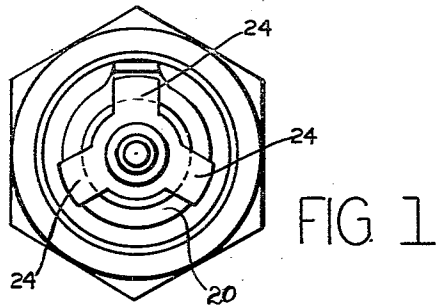
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2,767,267

HIGH FREQUENCY CONNECTOR UNIT

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HIGH FREQUENCY CONNECTOR UNIT

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4 Claims. (Cl. 200—51.1)

The present invention relates to a coupling joint or connector used primarily for high frequency lines of coaxial type, and in particular to a coupling unit wherein an impedance connection is established from the inner conductor to ground or to the outer conductor when the connecting plug is removed from the coupling circuits.

In high frequency coupling joints, it is necessary that the switching in and out of various elements, such as resistances and impedances be positively accomplished and that good contacts be maintained. It is further essential to preserve the coaxial line constants as far as possible that is the substitution of an impedance for the circuit impedance where this is possible.

In the present application a coupling element is employed wherein the opening of the coupling circuit or the opening of the connection between the inner conductor and ground or the other side of the line is obtained by movement of both the insulating core between the outer and inner conductor as well as the inner conductor itself, thereby preserving the positioned relationship of the inner conductor and the insulating core surrounding the inner conductor. In this way the core and inner conductor may be connected and a firm union of the parts obtained.

Other and further advantages of the present invention will be understood from the description in the specification set forth below when taken in connection with the drawings illustrating the invention, in which:

Figure 1 shows an end view of the coupling unit as seen from the left of Figure 2.

Figure 2 shows a longitudinal axial section through the coupling unit of the present invention.

Figure 3 shows a modified detail of elements shown in Figures 1 and 2, viewed from the left end of the coupling unit corresponding to the position as shown in Figure 2.

Figure 4 shows a detail in which the coupling socket provides a normal open circuit.

In the drawings, 1 represents the metallic outer conductor which may be of cast aluminum or other suitable material and is provided with an external flange 2 beyond which is a threaded section 3 on which may be screwed a nut 4 against a lock washer 5 for holding the coupling unit in a panel 6.

Any other type of clamping means may be used for fixing the outer conductor in position. Beyond the threaded section 3, there is a small neck section 7, the end 8 of which may be spun over the inclined surface of an insulating collar 9.

The collar 9 and the section 3 forms a small concentric cavity within the outer conductor in which there is maintained a spring 10 of several turns. The inner surface of the outer conductor is formed with an annular recess 11 which extends from a position near one side of the flange 2, but on the inner side of the outer conductor to the collar 9 which rests in a shoulder

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formed by the threaded section 3 and the turn-over end 8 of the outer conductor. There is therefore provided within the outer conductor a free annular space in which the coil spring 10 may rest. Within the outer conductor 1 there is contained a concentric coaxial insulating section 12 which extends from the right end of the outer conductor all the way through the conductor to the left end of the conductor as viewed in Figure 2. This is made of two pieces to facilitate the assembly. This coaxial insulating section or core 12 is provided with a frusto-conical end section which has a coaxial opening 14 through which the inner conductor 15 extends. The end of the inner conductor 15 is provided with a split type spring gripping connector 16 of the female or male type, commonly used in the connector art for receiving a corresponding plug-in element.

The insulating section 12 is of such a size as to come in contact with the surface of the walls of the outer conductor, but has a recessed section 17 which comes up against a smaller annular projecting ring 18 from the inner surface of the outer conductor, so that the motion of the core 12 or insulating core of the coupling unit is limited in its direction towards the right of the coupling element. Towards the center section of the core element 12, the core is enlarged in the section 19 to fit into the recess 11 of the outer conductor and to provide a bearing surface on its left end as viewed in Figure 2 for the spring 10 which tends to urge the insulating core 12 towards the right as viewed in Figure 2.

On the outside to the left of the collar 9, which is permanently fixed to the outer conductor, is a conductive disc 20, which in the normal position of Figure 2 is connected to the inner conductor as will be explained. This conductive disc with the terminal lug 21, is secured to the element 9 in any suitable manner as by crimping the edges of the disc over the element 9 or in any suitable way, and may be provided with a right angled member or element 21 for making suitable electrical connections to an external circuit. The inner conductor 15 carries a narrow conductive sleeve 22 attached to it externally of the core 12 and this sleeve grips by means of suitable clamping fingers or clamping flange 23, a conductor 24 which may be made in the shape of a center hub with three external arms as indicated in Figure 1, the outer end of which contacts the conducting ring element 20 whereby the external circuit connection is made to the inner conductor in the position shown in Figure 2.

The inner conductor 15, the sleeve 22, the connecting conductor or spider 24, and the insulating core 12, it will be seen, form joined elements fixed with reference to one another. The inner conductor 15 may be fixed in the sleeve or core 12 by a friction fit, or if desired, a small locking collar 25 may be used which is recessed on its inner edge in the inner conductor 15 and sets in a recess in the insulating core 12.

In this arrangement when a plug or connector is applied over the inner conductor 15 and the core 12, at the right of the core and locked in position, the inner core and conductor are moved away from the inner recess flange 18 along the axis of the conductor, which means that the inner conductor 15 and the core 12 at its very left end is also moved, moving the connector 24 to the left and opening the circuit between the conductor 21 and 20 and the inner conductor of the plug. This puts the plug center terminal in contact with the inner conductor 15, and the connector 24 and disconnects the lug 21 and 20 and its circuit which may comprise a loading resistor connected to the external conductor 1. When the plug is removed, the spring 10 will force the inner conductor 15 and the insulating sleeve or collar 12 to the right and close the connection between the ele-

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ments 21 and 20 and 24, thus replacing the plug circuit with a loading resistor connected between the external conductor and the element 21. This connection between the elements 21 and 24 may be a direction connection as indicated in Figure 2 or the element 24 or 20 may itself be an impedance element as indicated in Figure 3, where the disc 26 is an impedance disc between the conductor 20 and the connection at the inner collar, namely, the element 22. While therefore the coupling may be used to include an ordinary connecting element, other elements may be automatically cut into the circuit, whatever may be desired.

A particular gain is obtained in the present arrangement in that both the inner conductor and the core are moved providing positive opening and closing through the spring action in the annular space in which the spring is positioned.

It will also be noted that the design of the coupling unit is such that none of the line impedance need be disturbed since the ratios of the diameters of inner conductors and outer conductors can readily be preserved in the present design.

In the arrangement of Figure 4, when the plug is connected to the socket to the right of the broken portion of the figure, the shaft 15 and the collar or sleeve 22 is moved to the left and the reversed faced spider 24' is brought up against the connecting lug 21' which may be permanently attached to the disc 20' which is fixed on the insulating piece 9. In this arrangement therefore, putting the plug in place, closes the circuit to whatever may be connected to the lug 21'.

Having now described my invention, I claim:

1. A coaxial connector comprising an outer and inner conductor, an insulating core surrounding and fixedly connected to said inner conductor and slidable for a limited small movement within said outer conductor, a spring acting axially between said core and the inner surface of said outer conductor for restoring the core to an initial position when displaced said limited movement and means externally of said core providing an electrical connection between said inner conductor and one external circuit connection when said core is in its initial position.

2. A coaxial connector comprising an outer and inner conductor, an insulating core surrounding and fixedly connected to said inner conductor and slidable for a limited small movement within said outer conductor, means providing an annular cavity between the outer conductor and said core with an insulating flange secured to the outer conductor at one end of said cavity and a flange formed by the core at the other end of the cavity,

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a spring positioned in said cavity bearing at the flanged ends for exerting spring pressure against the same, means providing a switch contact element at the end of the internal conductor, means providing an opposing switch contact member adapted to be connected to the inner conductor, said spring acting to maintain an electrical contact between said contact elements in a normal position when no plug is inserted in the connector and said switch contacts adapted to be separated when a plug is mounted in said connector.

3. A coaxial connector comprising an outer and inner conductor, an insulating core surrounding and fixedly connected to said inner conductor and slidable for a limited small movement within said outer conductor, means providing an annular cavity between the outer conductor and said core with an insulating flange secured to the outer conductor at one end of said cavity and a flange formed by the core at the other end of the cavity, a spring positioned in said cavity bearing at the flanged ends for exerting spring pressure against the same, a conductive annular ring secured to the insulating flange coaxial with the connector, a conducting spider secured to the inner conductor in a position opposed to said annular ring, said spring acting to maintain an electrical contact between said conductive annular ring and said conductive spider in a normal position when no plug is inserted in the connector and said conductive annular ring and said conductive spider adapted to be separated when a plug is inserted in said connector.

4. A coaxial connector comprising an outer and inner conductor having an annular recess formed in the inner face of the outer conductor, a core slidably fitting in said outer conductor having an outwardly extending flange engaging a part of said annular recess, said inner conductor fitting concentrically in said core and fixed thereto, a spring in said annular recess bearing at one end against said flange and at the other end indirectly against the outer conductor, opposed conductive contact elements, one affixed to but insulated from the outer conductor and one, electrically connected to the inner conductor at the end of said connector and adapted to make and break electrical contacts with movement of said inner conductor with respect to said outer conductor.

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