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R. H. TANNER ET AL

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COAXIAL JACK

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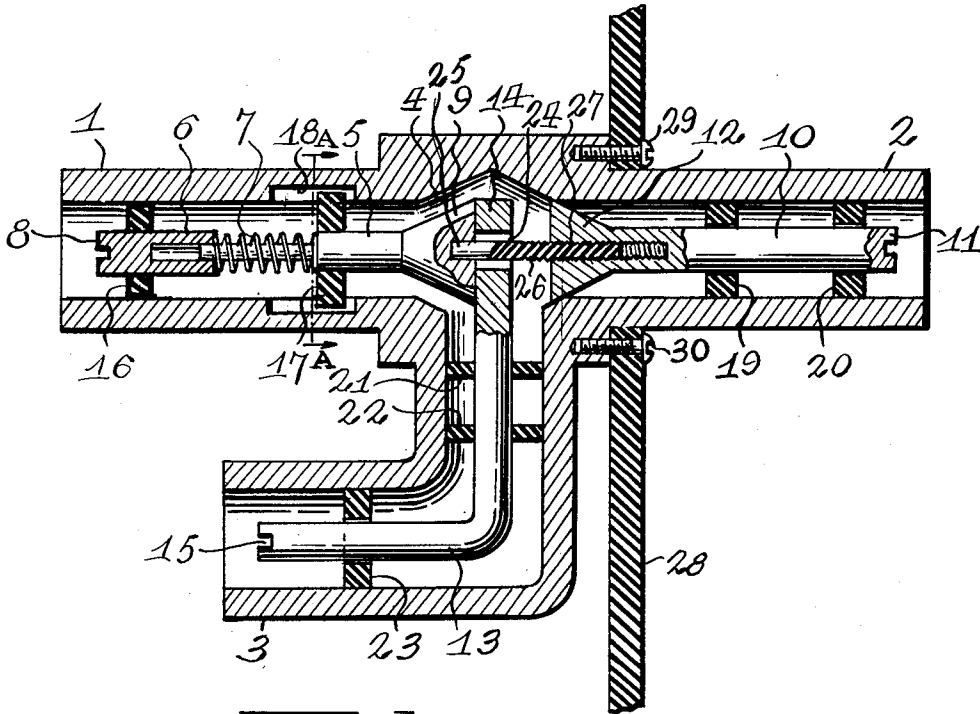


Fig. 1

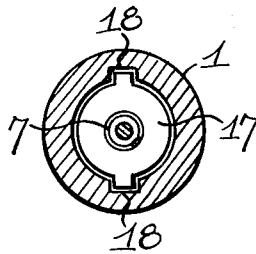


Fig. 2

Inventor
R. H. TANNER
J. RYWAK

By Robert B. Harmon
Attorney

1

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COAXIAL JACK

Robert H. Tanner and John Rywak, Belleville, Ontario, Canada, assignors to Northern Electric Company Limited, Montreal, Quebec, Canada, a corporation of Canada

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2 Claims. (Cl. 333—97)

This invention relates to a jack for directing energy between coaxial transmission lines.

A major problem, encountered in the use of coaxial transmission lines, is that relating to the rapid changing of the connections of a coaxial line to other associated lines, having the same or different characteristics, so as to maintain constant the characteristic impedance between the different lines. In one type of prior switch designed for this purpose, which selectively connects or disconnects only the inner conductors in changing the connection from one line to another, the mechanism includes a chamber in which the switching elements are disposed and into which the transmission lines enter. As is well known, the characteristic impedance of a high frequency coaxial line is related to the capacitance relation with respect to the concentric spacing between the inner and outer conductors of the line. Due to the effect of the chamber within the jack, which is necessarily large in relation to the cross section area of the transmission lines, and the disposal of the inner conductors of the transmission lines therewithin, there is a tendency to set up undesired reflections of energy and standing waves in the connected line, resulting from a mismatch of the impedance between the transmission lines and the chamber within the jack, with a consequent loss of energy.

It is an object of this invention to provide a novel jack, normally adapted to connect a pair of associated coaxial lines, whereby this connection may be broken and any one of a plurality of associated coaxial transmission lines connected to a particular member of the pair, with the characteristic impedance associated therewith tending to be constant.

It is a further object of the present invention to provide a novel jack with the foregoing characteristics and to additionally include means for connecting any one of a plurality of coaxial associated transmission lines to either member of the pair with the characteristic impedance associated therewith tending to be constant.

It is another object of this invention to provide a novel coaxial jack with the foregoing characteristics and to include only a small amount of reflections of energy and standing waves on the connected line.

A further object of this invention is to provide a novel jack with the foregoing characteristics having an improved capacitance relationship with respect to the concentric spacing between the conductors of the transmission lines within the jack.

These and other objects of one embodiment of the invention are obtained by providing a coaxial jack comprising a bored and chambered metallic housing, the bored sections extending to the chamber horizontally and vertically in a somewhat T-shaped manner, the switching elements being so arranged within the chamber that the continuity of the shielding of the engaged inner conductors is maintained and in which the switching elements and chamber are so formed that the tendency to set up undesired reflections of energy and standing waves is reduced.

2

A better understanding of the invention will be obtained by referring to the following description, taken in conjunction with the accompanying drawing, in which:

Fig. 1 illustrates a greatly enlarged diagrammatic view, partly in section, of the jack of this invention mounted on a jack panel; and

Fig. 2 illustrates a cross section of the jack taken at AA in the direction of the arrows.

Considering the drawing, the housing of the jack of the invention consists of oppositely disposed metallic sections 1 and 2 extending in a horizontal direction and a vertical metallic section 3 intersecting therewith to form a somewhat T-shaped structure with a chamber 4 therewithin, the sections forming the continuous outer conductor for the coaxial jack. Axially disposed within the bored section 1 are the inner conductors 5 and 6, conductor 5 being arranged in slidable and electrical conducting relation partially within conductor 6, with the former, conductor 5, in yieldable association with the latter by virtue of spring 7, one extremity of conductor 6 being bifurcated at 8 so that the inner conductor of a coaxial transmission line may be connected thereto and one extremity of conductor 5 having contact 9 secured thereto.

Axially disposed within the bored section 2 is the movable inner conductor 10, which is bifurcated at one extremity 11, so that the inner conductor of a coaxial transmission line may be connected thereto, and which has contact 12 secured to its other extremity.

Axially disposed in the section 3 is the fixed conductor 13 which has contact 14 secured thereto at one of its extremities and which is bifurcated at its other extremity 15, to which the inner conductor of the respective coaxial transmission line may be connected.

Conductors 5 and 6 are supported within the bored section 1 by insulating discs 16 and 17, disc 16 being fixed to conductor 6 and to the inside surface of section 1 and disc 17 being fixed to conductor 5 and being in slidable engagement within the notch 18 which is arranged so that disc 17 cannot rotate. Conductor 10 is supported by insulating discs 19, 20 which are secured to the inside surface of section 2 and in which conductor 10 is slidably fitted. Conductor 13 is supported by insulating discs 21, 22, 23 which are secured to conductor 13 and to the inside surface of section 3.

Contact 14 is provided with a central aperture 24 through which insulating rod 25 reciprocates, one extremity of the rod 25 being secured to contact 9 and the other extremity being provided with threads 26 suitable for adjustable engagement with threads 27 provided in contact 12 and in the associated extremity of conductor 10. Contacts 9 and 12 and the inside of chamber 4 have a configuration such that when either one of these movable contacts becomes engaged with fixed contact 14, the characteristic impedance presented by the chamber 4 should approach the characteristic impedance of the conductors 5, 6 and 13 or 10 and 13. In the presented embodiment, outer surfaces of contacts 9 and 12 and the inner surface of chamber 14 are mutually tapered and coaxial so that the concentric spacing between the inner conductors 5, 6 and 13 or 10 and 13 and the inside surface of sections 1 and 2 is continued into chamber 4 of the jack. It is preferable that the insulating discs 16, 17, 19, 20, 21, 22, 23 and the rod 25 be constructed of polystyrene due to the low dielectric loss characteristic of that material.

Any desired number of jacks of this invention may be mounted on panel 28 and secured thereto by fasteners such as screws 29, 30 as shown in the drawing.

In the operation of the jack, assuming as shown that conductor 5 is connected to conductor 13 through contacts 9 and 14, contact 12 will close the opening in section 2 of the housing of the jack thus maintaining the con-

3

tinuity of the inner surface of chamber 4 and thereby preventing the tendency to set up undesired reflections of energy and the creation of standing waves which would occur if the section 2 were left open. The above tendency is prevented also by the configuration of contact 9 and the inside of chamber 4 which, in the example shown in the drawing, is tapered, thus reducing the effect of a change in the concentric spacing of the inner and outer conductors. Since contact 9 or 12 is spaced apart from contact 14 when disengaged therefrom, the capacitance between contacts 9 and 14 or 12 and 14 is kept at a minimum.

When it is desired to disconnect conductor 5 from conductor 13 and to connect conductors 10 and 13, the inner conductor of the coaxial line associated with the inner conductor 10 is inserted in the bored section 2 to engage with, and to move, conductor 10 so that contact 12 engages with contact 14. The later removal of the inner conductor of the coaxial line associated with inner conductor 10, when it is desired to reconnect conductor 5 to conductor 13, permits spring 7 to cause contact 12 to become disengaged from contact 14.

When it is desired to connect conductor 5 to conductor 10, the incoming coaxial line at section 3 is disconnected and a selected coaxial line is inserted in section 2 of the jack, without any forward linear movement of the inner conductor 10, and rotated so that contact 12 of conductor 10 engages with contact 14, by virtue of threads 26, 27, contact 9 being held in engagement with contact 14.

Since any desired number of jacks may be mounted on the jack panel 28, interconnection of the coaxial transmission lines may be obtained by means of coaxial patching cords.

The jack of this invention, therefore, when employed with coaxial transmission lines, reduces the tendency to mismatch the impedances and in addition provides operational flexibility and an instant availability of spare equipment with a consequent reduction in cost in the operation of the lines.

4

What is claimed is:

1. A jack for coaxial transmission lines comprising: a hollow metallic housing having a chamber therewithin extending horizontally and vertically in a somewhat T-shaped manner; a pair of movable conductive members axially disposed along the common axis within the horizontal section of the housing; a fixed conductive member coaxially disposed within the vertical section of the housing; means for connecting one extremity of each of the three members to their respective transmission lines; contact members secured to the other extremity of each of the three conductive members, the contact member secured to the fixed conductive member being apertured and disposed between the movable conductive members; an insulated rod member disposed to reciprocate through the said aperture and having one extremity secured to a selected contact member of one of the movable conductive members and the other extremity arranged so that the other movable conductive member and its associated contact member may be rotatably advanced or retracted on the rod member; means associated with the selected contact member to prevent the rotation of the rod member, the movable contact members being arranged so that when one of these members is in engagement with the apertured contact member the other movable contact member, being in the retracted position, is in engagement with the housing so as to provide a substantial continuation of the inner surface of the chamber and means for urging the selected contact member into yieldable engagement with the apertured member.

2. A jack in accordance with claim 1 in which said chamber and said contact members secured to the movable conductive members are dimensioned so as to form an electrically matched continuation of the connecting coaxial transmission line.

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