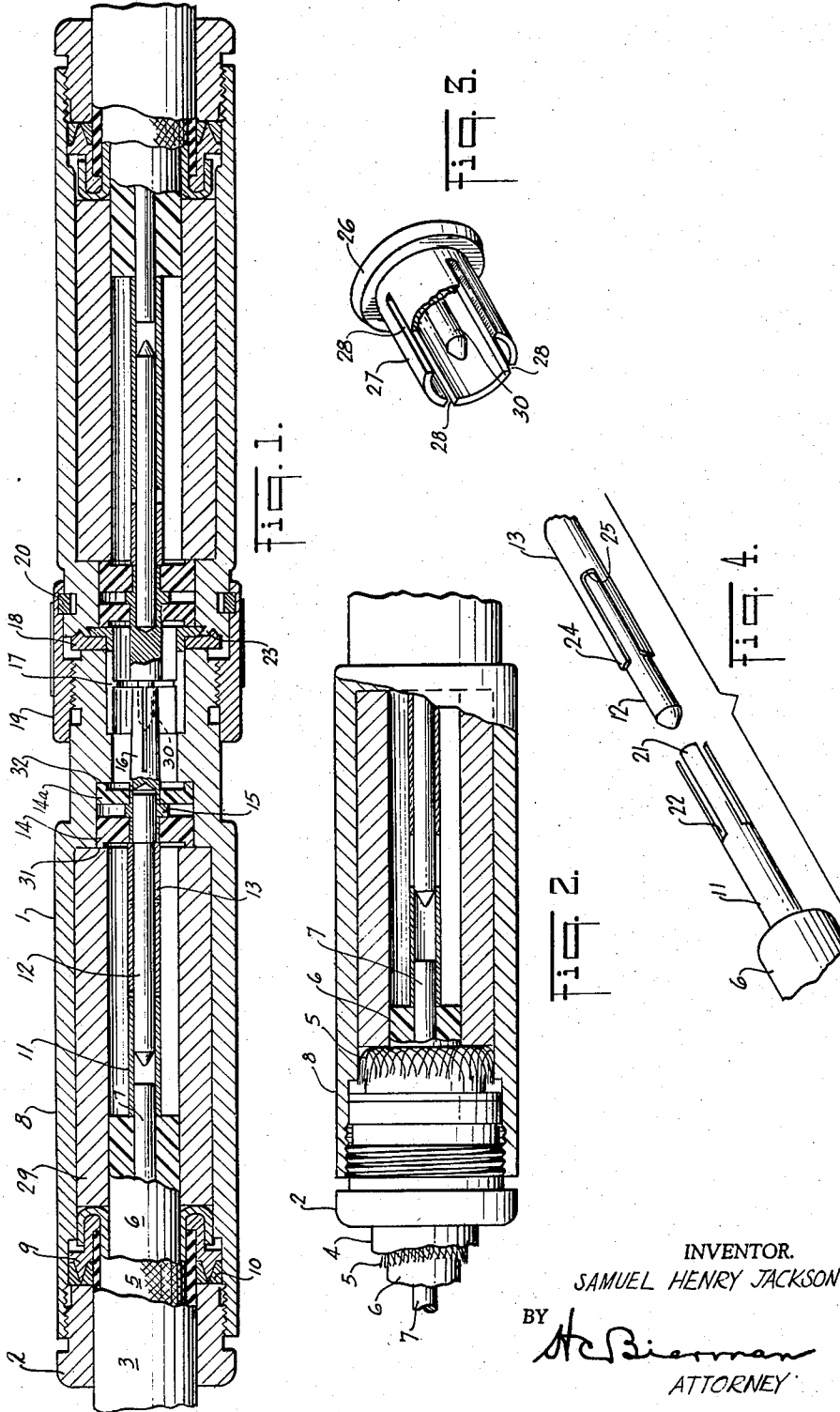


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COAXIAL CABLE CONNECTOR

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COAXIAL CABLE CONNECTOR

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This invention relates to cable connectors, more specifically to connectors for coaxial cables to be used at radio frequencies.

In the past, many types of coupling devices for coaxial cables have been designed. However, they possessed certain substantial disadvantages, namely that they did not allow for differential expansion and contraction of the cable layers resulting from ambient temperature variations, and further that the circuit was broken when the temperature dropped and the center conductor and dielectric contracted.

It is among the objects of this invention to provide a coupling device for coaxial cable which is ambient temperature compensated.

It is also among the objects of this invention to provide a coupling device for coaxial cable which has a captivated contact.

It is further among the objects of this invention to provide a coupling device for coaxial cable which is of constant impedance throughout.

It is still further among the objects of this invention to provide a coupling device for coaxial cable which is weather-proof.

It is still further among the objects of this invention to provide a coupling device for coaxial cable which will satisfactorily maintain contact throughout a wide range of temperature variation without appreciable change in impedance.

In practicing this invention, there is provided a coaxial cable having characteristically a center conductor, at least one dielectric layer, an outer conductor of braided or other form, and an insulating outer cover or jacket. In specific cases the insulating jacket may be omitted and/or additional concentric conducting and non-conducting layers of material added. Each layer of the cable is stripped back to a predetermined length from the cable end so as to expose successively the several elements thereof and a central contact is affixed to the extending portion of the center conductor. This contact is provided with longitudinal tongues and recessed areas which are perimetricaly spaced apart. A second central contact in longitudinal alignment with the first central contact is provided with a pin within the second contact and having similar perimetricaly spaced apart longitudinal tongues which are complementary to the tongues on the first central contact. The first central contact is adapted to slide over the pin placed within the second central contact and is so positioned that the longitudinal tongues of the first contact fit into the longitudinal recesses of the second central contact and vice versa.

Alternatively, the pin may be placed in the first central contact and the second central contact may be adapted to receive and interfit therewith. Further, one central contact may be solid with ribs perimetricaly spaced apart formed thereon and adapted to receive the longitudinal tongues on the complementary contact.

The outer conductor is held in contact with the outer

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shell of the coupling device and is insulated throughout from the center conductor circuit. The cable is held in place by a clamp nut which bears against a gasket and a clamp which in turn bears against the outer conductor itself. The single embodiment of this invention which is described herein is designed for use with a coaxial cable wherein the central conductor is solid and the outer conductor is braided wire. It is understood, however, that the use of coaxial cable having a hollow central conductor and/or a solid tubular outer conductor will require slight modification of this device, particularly in the manner in which the conductors are secured to the coupling.

When the temperature falls, the dielectric layer contracts at a greater rate than does the braid and the outer insulating jacket. Since the dielectric grips the center conductor, it causes the conductor to shrink with it and retract from the coupling. When this occurs, the inter-fitted tongues and recesses of the central contacts permit some degree of separation without the loss of electrical contact. Furthermore, since the tongues and recesses are interfitted as described above, the overall outer diameter of the central conductor and contacts remains substantially the same regardless of whether the center conductor is withdrawn from the coupling or pressed fully therein.

In the accompanying drawings constituting a part hereof and in which like reference characters indicate like parts,

Fig. 1 is a longitudinal cross-section of the complete coupling unit;

Fig. 2 is a view partly in section of the female half of the coupling;

Fig. 3 is a perspective view of the outer contact of the male half of the coupling, and

Fig. 4 is a perspective view of the compensating central hollow contacts.

Coupling device 1 comprises clamp nut 2 fitted over jacket 4 of coaxial cable 3. Clamp nut 2 is threaded into body 8 and bears against gasket 10 and clamp 9, over which outer conductor braid 5 is turned. Gasket 10 is split by the tightening of clamp nut 2 to a point where the sharp edge of clamp 9 contacts the clamp nut. The pressure of clamp nut 2 securely holds braid 5 between clamp 9 and sleeve 29. Dielectric 6 prevents any contact between braid 5 and center conductor 7. Affixed to center conductor 7 is central hollow contact 11 which is provided with tongues 21 of springy material and recessed areas 22.

Correspondingly central hollow contact 13 is also provided with tongues 24 of springy material and recessed areas 25. Acting as a base upon which the tongues 21 of central hollow contact 11 can slide is pin 12 secured in central hollow contact 13.

Female primary contact 16 is mounted on the end of pin 12 and abuts central hollow contact 13 and is of springy material slotted to permit the introduction therein of primary male contact 30. On the end of contact 16 nearest central contact 13 are mounted insulators 14 and 14a spaced apart by captivating shoulder 15. Insulator 14 bears against captivating shoulder 15 and the shoulder 31 formed by sleeve 29, and insulator 14a bears against the captivating shoulder 15 and the shoulder 32 formed by body 8.

There is also provided in the end of the female jack into which the male plug fits, a tapered portion adapted to receive outer contact 17 which is of springy material to insure good contact. The internal construction of the male plug is similar to the female jack with the exception of the primary male contact 30 and the outer contact 17. Outer contact 17 is provided with a base 26, barrel 27

and slots 28 for springiness. Formed-over portion 23 serves to retain the outer contact 17 in position and insures good contact.

Thus throughout the coupling, there exist two separate but related circuits. The circuit of the center conductor 7 is carried through central hollow contact 11, pin 12, central hollow contact 13, pin 12, primary female contact 16, primary male contact 30 and thence in a similar manner through the male half of the coupling device 1. In the outer conductor circuit, contact is maintained by the pressure of clamping nut 2 which indirectly squeezes braid 5 between clamp 9, sleeve 29 and body 8. The current flows through these members to outer contact 17 into the body and sleeve of the male portion of the coupling and thence to the outer conductor itself on the other piece of cable.

The two halves of the coupling are held together by coupling nut 19 which is provided with movable retaining ring 20 so that it may be tightened and loosened without causing the cable to rotate.

One of the most important features of this invention is the maintenance of constant impedance throughout the coupling. Impedance is a function of the relationship between the outer diameter of the center conductor and the inner diameter of the outer conductor as well as the dielectric. Hence, with changes in the material of which the dielectric is composed, the diametric ratios referred to above must also be adjusted. Therefore, it is important that central hollow contacts 11 and 13 be equipped with tongues and/or recesses as shown in Fig. 4, so that the overall outer diameter of this portion of the center conductor remains the same. Thus when dielectric 6 contracts and carries the center conductor with it, contacts 11 and 13 will slide longitudinally so that the tongues are spaced apart from the complementary portions of the recesses. The overall outer diameter of this portion of the center conductor remains substantially the same with the exception of small portions near the bases of the recessed areas 22 and 25.

Although only one specific embodiment of this invention has been disclosed, changes such as would be apparent to one skilled in the art are contemplated. For example, the various contacts and conductors may be plated or formed entirely of precious metal such as gold or silver, for improved conductivity. Those parts which require springiness may be made of any suitable metal appropriately plated, if desired. Appropriate adjustments of the ratios of the outer diameter of the center conductor to the inner diameter of the outer conductor are necessary to compensate for changes in the insulators and the dielectric materials.

The coupling nut may be altered to include a bayonet clamp or any other suitable means for locking the male and female halves of the coupling device together. The outer conductor may be soldered or otherwise affixed directly to the shell. Where the center conductor is hollow, the central contacts may be solid rather than hollow and adapted to fit inside said conductor. The invention need not be used in the male plug and female jack arrangement herein indicated, but one or the other

half may be connected to an adapter, or be formed as a T, Y, or elbow coupling. Furthermore, the coupling device may be pressurized by the employment of suitable gaskets and the like.

These and other changes may be made without departing from the scope and spirit of this invention, which is to be broadly construed and not to be limited except by the character of the claims appended hereto.

I claim:

1. In a device for coupling a coaxial cable with a center conductor, an outer conductor, and at least one layer of dielectric therebetween, having a substantially hollow body and means for securing said outer conductor to one end of said body, the improvement which comprises a first central contact, a second central contact in longitudinal alignment therewith, at least one of said contacts being secured to said center conductor, at least one of said contacts being provided with perimetricaly spaced apart longitudinal tongues, another of said contacts being provided with recesses complementary to said tongues and adapted to be interfitted therewith.

2. In a coupling device according to claim 1, the improvement wherein said recesses are formed by perimetricaly spaced apart longitudinal ribs, said recesses adapted to receive said tongues on the other of said contacts.

3. In a device for coupling a coaxial cable with a center conductor and an outer conductor, having a hollow body and means for securing said outer conductor to one end of said body, the improvement which comprises a first central hollow contact secured to said center conductor and provided with perimetricaly spaced apart longitudinal tongues, a second central hollow contact in longitudinal alignment with said first hollow contact, a pin in said second contact, said second contact being provided with perimetricaly spaced apart longitudinal tongues complementary to the tongues on said first hollow contact and adapted to be interlaced therewith.

4. In a device for coupling a coaxial cable with a center conductor and a shield braid, having a hollow body, a clamp nut threaded into one end of said body and a braid clamp contacting said braid, the improvement which comprises a first central hollow contact secured to said center conductor and provided with perimetricaly spaced apart longitudinal tongues, a second central hollow contact in longitudinal alignment with said first hollow contact, a pin in said second contact and extending from the end thereof, said second contact being provided with perimetricaly spaced apart longitudinal tongues complementary to the tongues on said first hollow contact and adapted to be interlaced therewith.

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