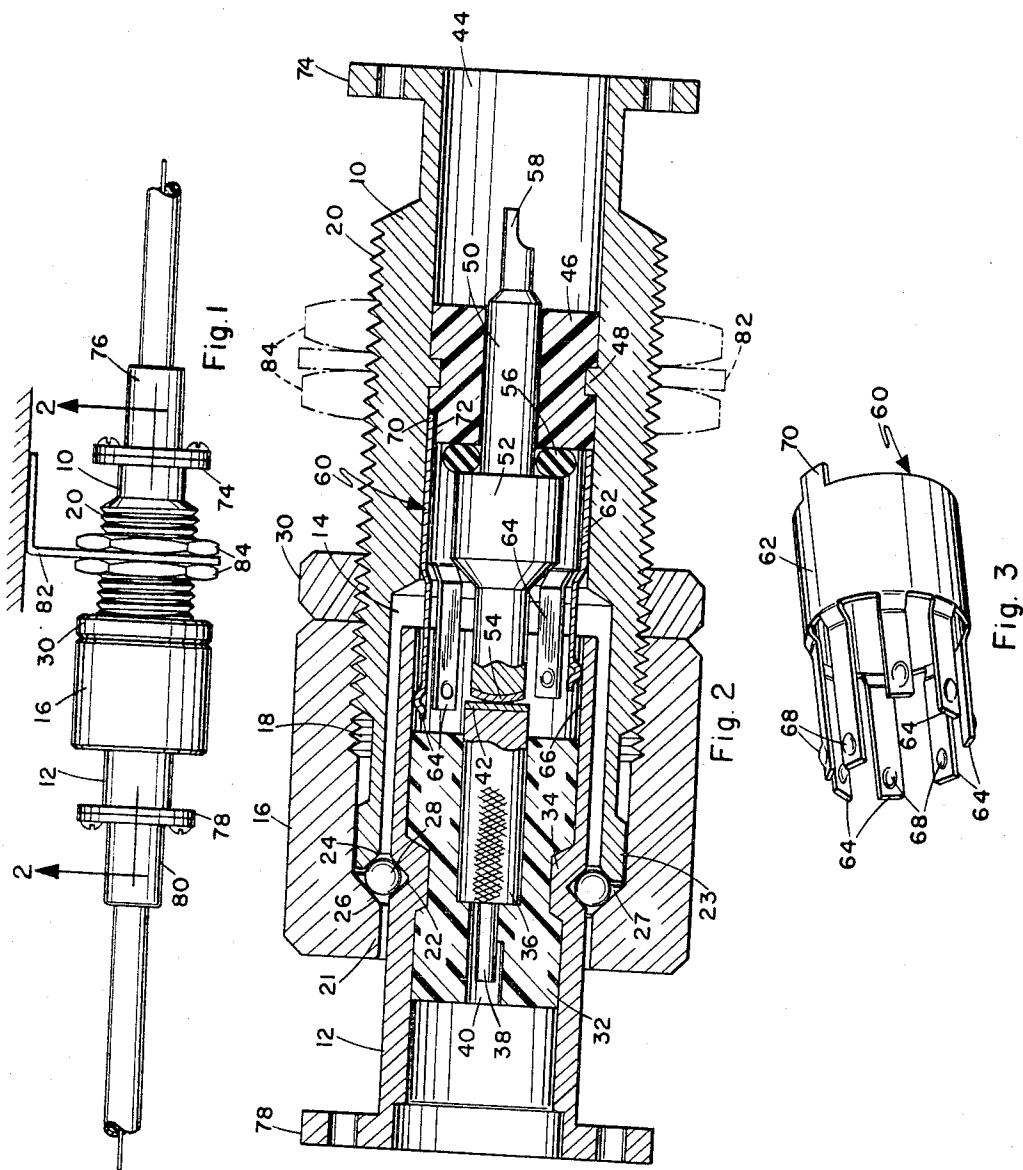


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ROTATABLE COAXIAL COUPLING

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ROTATABLE COAXIAL COUPLING
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ABSTRACT OF THE DISCLOSURE

The coupling is designed to minimize electrical noise and undesirable inductance and capacitance by utilizing a plurality of resilient fingers of different, non-harmonic lengths for the ground or shield contact and a springless pin arrangement for the center contact of a coaxial cable; the structure uses a minimum of parts and incorporates a free running bearing within the coupling parts themselves.

Background of the invention

The present invention relates to electrical connectors and specifically to a rotatable coupling for coaxial cables. Existing types of rotatable couplings for coaxial cables use a variety of resilient contacts, wipers, slip rings and the like. Usually one contact is an abutting, end-to-end or face-to-face contact maintained by a coil spring, while the other uses resilient conductive tabs or fingers frictionally engaging another conductor. The latter is sometimes a sleeve split longitudinally to grip a central contact, but the friction is excessive due to the large contact area involved and the rigidity of the arcuately cross sectioned elements of the split sleeve. If this contact is made by a plurality of small resilient fingers to reduce friction, a vibration problem arises. Since coaxial cables are often used for carrying television signals, or similar high frequency signals, it is desirable to avoid unnecessary changes in inductance or capacitance through the coupling. Coil springs around one or both of the conductive elements of the coaxial line will cause an inductive field, which must be compensated for. The resilient wipers or fingers, especially if they are of any reasonable length, have been known to resonate under certain conditions and to cause electrical noise in the line, in addition to being prone to wear if the rotation in the coupling is excessive.

Summary of the invention

In the coupling described herein the center contact is maintained in abutting, free turning relation without the use of an actual spring, while the shield or ground connection is made by a wiper element having a plurality of resilient fingers of different, non-harmonic lengths. Thus any vibration which might occur in one finger is damped out in the complete wiper element and electrical noise is effectively eliminated. The structure contains very few parts and a freely rotating bearing is incorporated into the structural elements themselves, rather than being installed as a separate component.

Brief description of the drawing

FIGURE 1 is a side elevation view of the coupling in a typical use;

FIGURE 2 is an enlarged sectional view taken on line 2-2 of FIGURE 1; and

FIGURE 3 is a perspective view of the multiple finger wiper element.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawing.

Description of the preferred embodiment

The coupling comprises an elongated, generally cylindrical

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drical conductive barrel 10 and a rotatable conductive sleeve 12 which fits coaxially into a large bore 14 in one end of the barrel. Concentric with sleeve 12 is a retaining collar 16 having internal screw threads 18 which screw onto an externally threaded portion 20 of barrel 10, the outer end of the collar having an inwardly thickened flange 21 fitting closely around said sleeve. Sleeve 12 has an annular bearing channel 22, preferably V-shaped in cross section, the end of barrel 10 at the end of bore 14 having an outwardly thickened portion 23, the end rim 24 of which is internally bevelled and the inner portion of flange 21 opposed to end rim 24 has a bevelled wall 26. The bearing channel 22 and the two bevelled faces 24 and 26 together form an annular raceway 27 for ball bearings 28, so that a bearing is incorporated directly into the coupling structure. The bearing can be assembled by sliding collar 16 over sleeve 12 and dropping ball bearings 28 into the annulus, so that they collect in channel 22 and against bevelled face 26. Barrel 10 is then screwed into collar 12 until the bevelled end rim 24 contacts the ball bearings to complete the enclosed raceway 27. The thickened end portion 23 of barrel 10 is machined to be a close fit in collar 16, so that any slight expansion caused by tightening the assembly will seat the outer face of the thickened portion against the inner wall of the collar, thus forming a rigid raceway. The expansion is only a matter of a few thousandths of an inch and is well within the inherent elasticity of the material. When the bearing is suitably adjusted, collar 16 is locked in place by a lock nut 30 on threaded portion 20. This bearing arrangement holds the sleeve 12 securely against angular shifting and eliminates the need for a second bearing, while also holding the sleeve in proper axial relation so that proper contact is maintained.

Within sleeve 12 is an insulated plug 32 held in place by an internal rib 34 in the sleeve, the rib also serving to reinforce the area of the bearing channel 22. Axially secured in plug 32 is a conductive post 36, the outer end of which has a connecting pin 38 disposed within a socket 40 in the plug to receive a conventional male connector of a coaxial cable. Post 36 may be knurled or otherwise treated to ensure firm locking in the plug 32, which latter may be molded in place in the sleeve. The inner end of post 36 has a contact face 42 of conductive wear resistant material and protrudes slightly from plug 32, the material also being corrosion resistant to avoid oxidation which might cause semiconduction or rectification and degrade the signal.

Barrel 10 has a reduced size bore 44 extending axially from bore 14 to the other end of the barrel, and fixed within bore 44 is an insulated plug 46, keyed in place by an internal rib 48. Axially mounted in plug 46 with a close sliding fit is a center pin 50 having an enlarged body portion 52 intermediate its ends. The inner end of center pin 50 is rounded and has a conductive wear resistant contact face 54 to make tangential contact with the flat contact face 42, the two contact faces being of similar material. Contact is maintained by a resilient pressure ring 56, such as a rubber O-ring or the like, between plug 46 and the enlarged body 52, the pressure ring being under slight compression when the coupling is assembled. Since the sleeve is securely held against axial shifting by the integral bearing, proper contact of the center pin and post is assured. The outer end of center pin 50 has a connecting pin 58 to receive a conventional female end connection of a coaxial cable.

On the inner side of plug 46 is a conductive wiper element 60 having a cylindrical portion 62 which fits firmly in bore 44 and makes electrical contact with barrel 10. Projecting from the inner end of cylindrical portion 62 are integral resilient fingers 64 which ride on the inner

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contact wall 66 of sleeve 12. To minimize friction and wear each finger 64 may have an outwardly projecting dimple 68 adjacent the tip thereof to make the actual contact. All of the fingers 64 are of different lengths and, considering the fingers as reeds, are of nonharmonic resonant frequencies, so that vibration of one finger will not cause vibration of any other. This arrangement also spreads the contact axially over wall 66 and further reduces wear. The outer end of cylindrical portion 62 has a protruding locking lug 70 which seats in a correspondingly shaped notch 72 in plug 46 and holds the wiper element against rotation.

Coaxial connectors of various types are in common use and the coupling is readily adaptable to any type. As illustrated, the outer end of barrel 10 has a flange 74 to hold a flanged connector 76 and the outer end of sleeve 12 has a similar flange 78 to hold a flanged connector 80.

In normal use the barrel 10 will be attached to a convenient support while the sleeve 12 is allowed to rotate as necessary. A typical arrangement, shown in FIGURE 1, uses a bracket 82 through which barrel 10 fits, the barrel being secured to the bracket by nuts 84 on threaded portion 20. The actual mounting will depend on the particular use.

It is most unlikely that the rotational speed of the coupling will be high enough to cause resonance, the usual causes being outside sources, such as associated electrical apparatus, or electromagnetic fields in the coaxial line. Any tendency of any one finger 64 to vibrate will be damped out in the unitary wiper element and no undesirable electrical noise will be introduced into the coaxial line. Since no spring is used in the coupling there is no problem of inductance from the effect of a coil in the electrical field. Further, there is no alternating or layered structure of conductive and insulative material which could cause undesirable capacitance in the coupling. The very simple structure makes the coupling economical to manufacture and easy to service, all parts subject to wear being easily replaceable.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawing are to be considered as merely illustrative rather than limiting.

I claim:

1. A rotatable coaxial coupling comprising:
 - a barrel element having means for connection to a coaxial cable;
 - a sleeve axially rotatably mounted in said barrel and having means for connection to a coaxial cable;

a wiper element electrically connecting said barrel to said sleeve, said wiper element having a plurality of resilient fingers frictionally engaging said sleeve and said fingers being of different lengths.

2. The structure of claim 1, wherein said fingers are resonantly non-harmonic with respect to each other.

3. The structure of claim 1, wherein said barrel and said sleeve are conductive;

a conductive post axially mounted in said sleeve and insulated therefrom;

a conductive center pin axially mounted in said barrel and insulated therefrom;

and pressure means biasing said center pin into abutting contact with said post.

4. The structure of claim 3 and including an insulated plug in said sleeve in which said post is fixed;

a second insulated plug in said barrel in which said center pin is axially slidable, said center pin having an enlarged portion between said second plug and the post contacting end thereof;

and said pressure means comprising a resilient ring compressed between said second plug and said enlarged portion.

5. The structure of claim 4, wherein said wiper element has a cylindrical portion fitting tightly in said barrel, said fingers being integral with and extending axially from said cylindrical portion;

said sleeve having an internal contact face, concentric with said post, on which said fingers are frictionally engaged.

6. The structure of claim 1, wherein said sleeve is mounted in one end of said barrel, said sleeve having an annular bearing channel coincident with said one end of the barrel;

a collar adjustably mounted on said barrel and having an inwardly thickened flange closely concentric with said sleeve adjacent said one end of the barrel;

the confronting portions of said flange and said one end being oppositely bevelled and forming, with said bearing channel, a raceway;

and a plurality of ball bearings in said raceway.

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