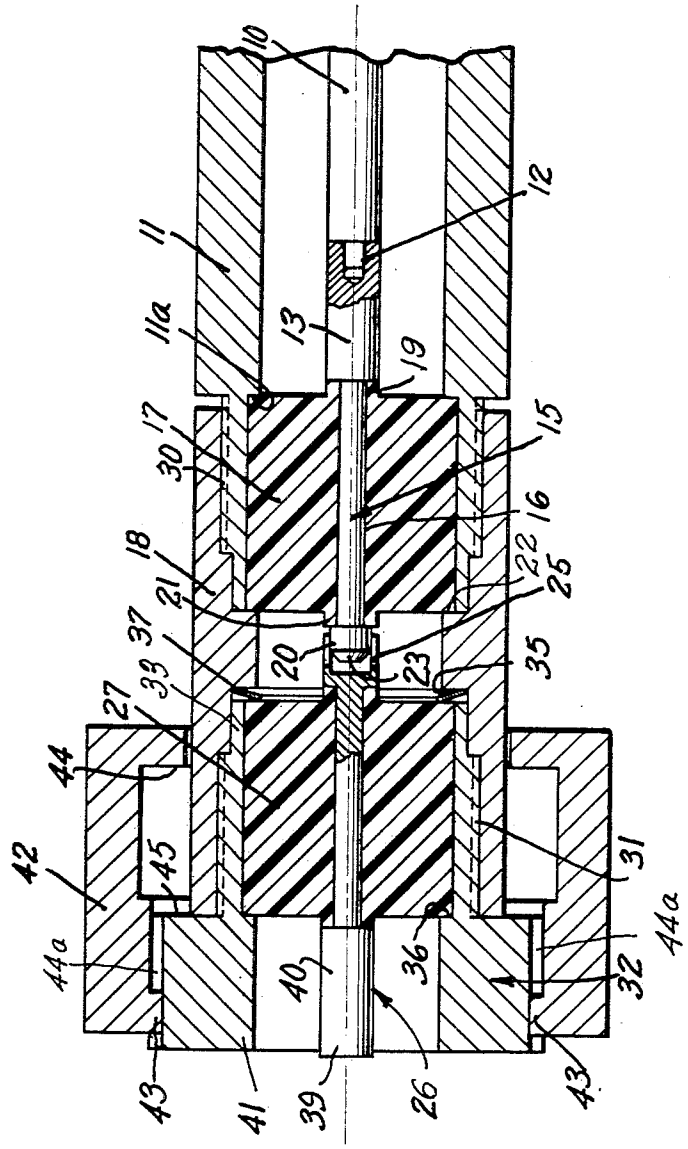
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FACE CONTACT COAXIAL CONNECTOR

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FACE CONTACT COAXIAL CONNECTOR

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ABSTRACT OF THE DISCLOSURE

Face contact coaxial connector in which the two halves of the connector are similar and the inner and outer contacts complete a circuit by face contact of the contacts. The inner coaxial contact of each half of the connector is in the form of a contact pin having outer flat contact face and biased outwardly with respect to the outer end of the outer contact of the connector by a spring of a larger diameter than the diameter of the contact pin. The contact pin is mounted in a dielectric support slidably carried by the casing part of the connector.

BACKGROUND OF THE INVENTION

Face contact connectors have heretofore been in use in which the electrical connection is attained by the mutual pressing together of the plane contact faces of inner and outer coaxial contact members of each half of the connector. In such face contact connectors, an inner conductor pin has been mounted in a dielectric support, which is rigidly mounted in an outer contact sleeve. The pin has been a fixed pin and has had a conductor sleeve slidably mounted thereon and urged by a spring in a direction to make contact. With connectors of this type, the inner conductor pin must be very small because of the required characteristic impedance value. As for example in a connector having an outer diameter of 7 mm., the outer diameter of the inner conductor required to give a 75 ohm impedance is 2 mm. With such a small conductor it is not possible to mount a spring of the required strength within the conductor sleeve, which will bias the sleeve with respect to the outer conductor and still maintain the best possible strength characteristics for the inner conductor and for its mounting within the outer conductor.

SUMMARY OF INVENTION AND OBJECTS

The present invention remedies the deficiencies heretofore present in face contact conductors by so arranging the connector that the inner conductor pin can be spring biased to make face contact with an associated pin of a mating connector half regardless of the diameter of the inner conductor, without impairing the strength characteristics of the conductor pin.

A principal object of the present invention, therefore, is to provide a simplified form of face contact coaxial connector, so arranged as to enable the use of a relatively large diameter spring, independent of the diameter of the inner conductor pin, to bias the inner conductor pin outwardly of the coaxial outer conductor, to maintain efficient electrical contact with a corresponding inner conductor pin of a mating connector half.

Another object of the invention is to improve upon the face contact coaxial connectors heretofore in use, by providing an inner conductor pin having a plane outer face axially fixed in a dielectric support, mounted within the inner conductor for axial movement with respect thereto, and spring biased to urge the plane face of the conductor pin into contact engagement with the conductor pin of a coupled mating connector half.

A still further object of the invention is to provide a face contact coaxial connector having an inner conductor pin fixed to a dielectric support, guided within an outer conductor for axial movement therealong, in which the biasing means for the conductor pin is a coned disk spring, biasing the dielectric support and conductor pin in an extended contact making position.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the figure of the drawing, showing a diagrammatic cross-sectional view taken through one-half of a face contact coaxial connector, constructed in accordance with the principles of the present invention.

In the embodiment of the invention diagrammatically illustrated in the drawing, the figure of the drawing diagrammatically shows one-half of a face contact coaxial connector adapted to be connected to another half of a coaxial connector, to complete an electrical circuit between an inner conductor **10** and an outer conductor **11** of an associated coaxial cable. As shown in the drawing, the inner conductor **10** is insulated from the coaxial outer conductor **11** by suitable insulating material, and has a reduced diameter terminal end portion **12** extending within a head **13** of an inner conductor member **15**, and soldered or otherwise bonded to said head. The inner conductor member **15** has a reduced diameter portion **16**, extending through a stationary dielectric support **17**.

The dielectric support **17** is recessed within an enlarged diameter interior end portion of the outer conductor **11** in abutting engagement with an annular shouldered portion **11a** of said outer conductor. The dielectric support **17** is retained in position by a coupling sleeve **18** threaded on the conductor **11** and having an intermediate shouldered portion **22** abutting the outer end of said dielectric support **17**. The support **17** also has a reduced diameter inner end portion **19** extending along the insulation for the inner conductor **10** and abutting the outer end of the enlarged diameter head **13**.

The opposite end of the inner conductor member **15** from the head **13** has an enlarged diameter contact head **20** abutting at its inner side a collar **21** formed integrally with the dielectric support **17**, and having a frustoconical outer end portion **23**. The contact head **20** forms a slidable current conducting connection for a cup-like contact member **25** formed integrally with a conductor pin **26**, and slidably extending about said head. The conductor pin **26** extends along the center of and is fixed to a dielectric support **27**, for axial movement therewith.

The opposite end of the coupling sleeve **18** from the dielectric support **17**, is counterbored and threaded to receive a threaded sleeve portion **31** of a retainer member **32**. The sleeve portion **31** has a reduced diameter inner end portion **33** spaced from a shoulder **35** at the inner end of the counterbored portion of the coupling sleeve **18**. The retainer member **32** also has a shouldered portion **36** at the termination of the retainer member **32** with the sleeve-like portion **31**, and determining the outer limits of movement of the conductor pin **26**. A spring **37**, shown as being a coned disk spring, known to the trade as a Bellville spring, is seated on the shoulder **35** and engages the inner face of the axially movable dielectric support **27**. The spring **37** therefore biases the dielectric support **27** into engagement with the shoulder **36** and biases a plane contact face **39** at the outer end of an enlarged diameter portion **40** of the conductor pin **26**, in advance of an outer face **41** of the retainer member **32**, which outer face forms the contact face of an outer conductor part of the connector.

A coupling ring **42** encircles the retainer member **32** and is provided to couple the two halves of the connector together and to draw the plane outer face **41** of the re-

tainer member **32** into firm current conducting engagement with the plane outer face of a mating connector half. The coupling ring **42** is of a conventional form and has a pair of lugs **43** extending along keyways **44a** extending axially along the retainer member **32**. The coupling ring **42** is slidable along the retainer member **32** and along corresponding keyways in a similar retainer member of the next adjacent coupling half, and is turnable along threads of the next adjacent coupling half to bring an inwardly extending radial flange **44** of the coupling ring **42** into engagement with a rear shouldered face **45** of the retainer member **32**. The lugs **43** are then turned along threads (not shown) in the retainer member for the next adjacent coupling half, to bring the end faces **41** of the retainer members **32** of each coupling half into firm engagement with each other. Similar threads (not shown) are provided in the periphery of the retainer member **32** of each coupling half, and each coupling half usually carries a separate coupling ring, so either coupling ring may be used to couple the coupling halves together.

It may here be seen that by the connector of the present invention, the usual small diameter coil spring connected between the inner conductor pin and the conventional sleeve extending thereabout has been eliminated, and that instead a coned disk spring of a relatively large diameter, taking very little axial space, is seated on the shoulder of the connector sleeve **18** and engages the dielectric support **27**, to bias the conductor pin **26** outwardly, entirely free from the conductor pin **26**. This enables the conductor pin to be of a relatively small diameter and still be stable and resistant to bending or breakage, and provides sufficient biasing force on the conductor pin to make a good electrical contact between the faces of two mating conductor pins when the two halves of the connector are connected together.

It may further be seen that the connector is of a simple and inexpensive construction and that the sliding contact **25** between the conductor pin **26** and the contact head **20** of the conductor pin **15** is in a protected region behind the dielectric support **27**, and is accordingly protected from mechanical damage and dirt. This provides reliable contact between the conductor pins **15** and **26** even under the most unfavorable conditions, and materially simplifies the mounting of the coaxial cable on the connector and the connection of the adjacent connector halves together.

While we have herein shown and described one form in which the invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

We claim as our invention:

1. A face contact coaxial connector comprising,
an outer conductor,
a coaxial inner conductor,
said outer conductor having a counterbore,
a dielectric support guided in said counterbore for limited axial movement therealong,
an inner conductor pin carried by said dielectric support and having current conducting contact with said inner conductor and being axially movable with respect thereto,
and means contained in said counterbore and resiliently biasing said inner conductor pin outwardly with respect to the front face of said outer conductor, to have face contact with an aligned conductor of a

companion coupling half, and to be resiliently displaced inwardly of said counterbore, upon coupling said connector to the companion connector half.

2. A face contact coaxial connector in accordance with claim **1**, wherein the means contained in the counterbore and resiliently yieldably biasing the inner conductor pin is a coned disk spring seated in said counterbore and engaging said dielectric support.

3. A face contact coaxial connector according to claim **1**,
wherein the guiding connection for said dielectric support in said counterbore comprises,
a sleeve extending within and along said counterbore for a portion of the lentgh thereof and having an enlarged diameter retainer member on its outer end, the front face of which forms an outer contact, and also having a shoulder, limiting outward movement of said dielectric support,
wherein spring means seated in said counterbore has operative engagement with said dielectric support and biases said inner conductor pin to have face contact with a corresponding conductor pin of an axially aligned coaxial connector coupling half.

4. A face contact coaxial connector in accordance with claim **3**, wherein the spring means is a coned disk spring seated between said counterbore and said dielectric support.

5. A face contact coaxial connector in accordance with claim **1**,
wherein the current conducting contact between said inner conductor pin and said inner conductor comprises an axially fixed inner conductor member having an enlarged diameter head,
wherein a dielectric support is provided for said fixed inner conductor member, inwardly of said dielectric support for said axially movable conductor pin and fixed from movement relative to said outer conductor,
wherein the conductor pin has axially slidable current conducting connection with said head, and
wherein spring means seated between said counterbore and said dielectric support bias said conductor pin outwardly of said outer conductor to have face contact with a corresponding conductor pin of an adjacent coupling half, upon the connection of two mating coupling halves together.

6. A face contact coaxial connector in accordance with claim **5**, wherein the spring means is a coned disk spring seated in said counterbore and engaging said dielectric support.

UNITED STATES PATENTS

References Cited

709,746	9/1902	Clopton.	
883,225	3/1908	Niederlander	339—48

FOREIGN PATENTS

1,033,752	7/1958	Germany.
1,048,956	11/1966	Great Britain.

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