Sept. 2, 1969 L. A. FLORER 3,465,281

BASE FOR COAXIAL CABLE COUPLING

Filed Oct. 2, 1967

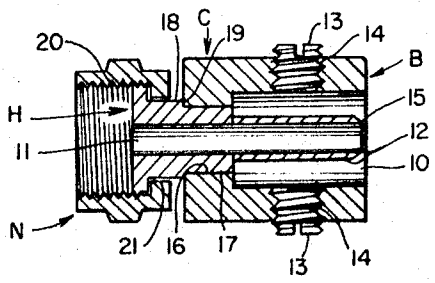

FIG. 1

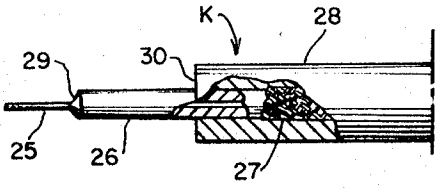

FIG. 2

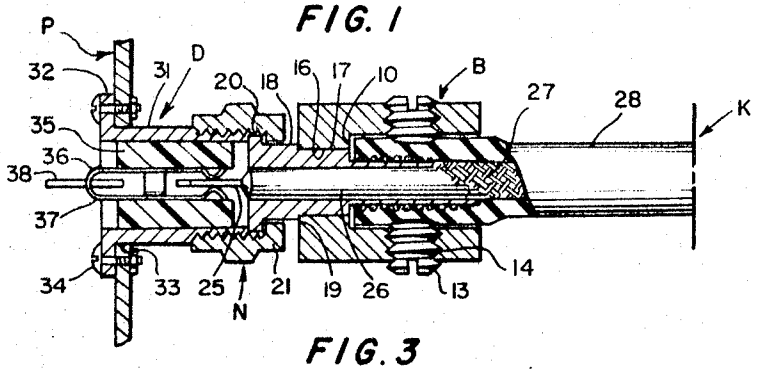

FIG. 3

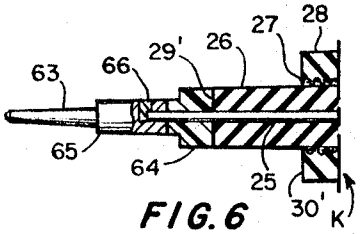

FIG. 6

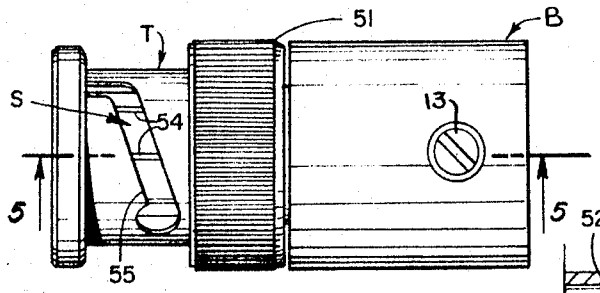

FIG. 4

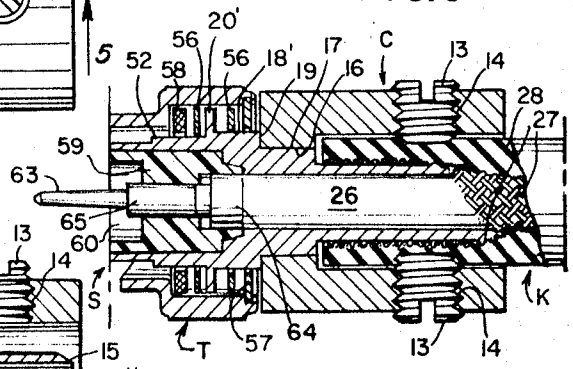

FIG. 7

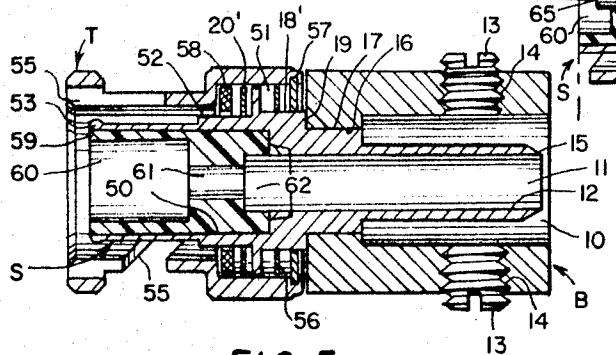

FIG. 5

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BASE FOR COAXIAL CABLE COUPLING

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U.S. Cl. 339—89 4 Claims

ABSTRACT OF THE DISCLOSURE

An improved base for a coaxial cable coupling adapted to be used with several types of coupling connectors. The connectors are exemplified in the disclosure as a nut for turning upon an externally threaded stub and as a split sleeve jack within an attachment thimble. The base is a short, tubular member with the coupling connector at its leading end and sockets at its trailing end to receive the end of a coaxial cable. The structure includes further an axially centered, tubular sleeve within this socket whose passageway extends through the head. The sleeve is adapted to fit over the core insulation of a peeled back end coaxial cable and underneath the braided shield of the cable. The core insulation, extending through the unit, is peeled back from the axial conductor wire within the coupling connector for attachment of the wire to a finger or pin. The unit is completed by opposing lock screws in the base which extend into the socket to bear against opposing sides of the cable to press the shield against the sleeve and to lock the members together.

This invention relates to coaxial cable couplings, and more particularly to improvements in the base structure thereof which connects with the end of a cable, a primary object of the invention being to provide a novel and improved connector base in a coaxial cable coupling which is especially adapted for field use by the maintenance engineer and repairman of high frequency electronic equipment.

The shielded, coaxial conductor has become an essential part of electrical systems handling ultra high frequencies and coaxial cables have become, to a considerable extent, standardized in their construction. The typical cable, and the type of cable with which the present invention is concerned, includes an axial conductor, usually a copper wire, carried within a tubular core of insulation material, usually of a plastic, such as neoprene. A braided metal sleeve forms an outer conductor or shield, usually of braided copper or aluminum wire, which embraces the insulation core. In turn, the shield is covered by a plastic outer sheath.

Connectors and couplers for coaxial conductors or cables must preserve the axial symmetry, continuity and shielded arrangement of the cable. Several different types of couplers are proposed for this purpose. Certain types of these connectors require special equipment for their connection and, as such, are suitable for production and shop use, such as for preparing cables for field or production line installations. These connections are satisfactory in their performance, but they are not suitable for field repairs of the cables where the repairman may have only a minimum of tools and equipment available. The need for a connector which can be attached in the field without special tools has heretofore been recognized and certain types of field connectors have been proposed. However, none of these have proven to be satisfactory and are either difficult to connect to the end of the cable or they cause significant changes in the capacitive relationship between the inner conductor and the shield where high frequencies are involved.

The present invention was conceived and developed with the above considerations in view, and comprises, in essence, a base for connection with a coaxial cable which may carry any common type of connector head for attachment to another connector or a standard fixture on the equipment being serviced, the base being adapted to receive the end of a coaxial cable, extend the conductor and core through it to the connector head. The base connects with the braided shield by pressing the shield against a supporting sleeve about the core insulation to avoid distorting this shield in any manner which could affect the capacitance of the circuit.

It follows that another object of the invention is to provide a novel and improved coupling for a coaxial cable which is adapted to be quickly, easily and securely fitted onto the end of a coaxial cable as a field installation by a repairman of ordinary skill and without the use of any special tools.

Another object of the invention is to provide a novel and improved base of a coupling for a coaxial cable which may use any selected type of coupling connector for fitting with a corresponding type of fixture.

Another object of the invention is to provide a novel and improved coupling for a coaxial cable which will not adversely affect the electrical characteristics of the system where the connector is used.

Another object of the invention is to provide a novel and improved coupling for a coaxial cable which is primarily for field use by a repairman, but is also ideally suitable for shop and factory use, as where completed cables are prepared for subsequent installation, and especially where such cables are apt to be changed, modified or replaced in the field.

Other objects of the invention are to provide a novel and improved coupling for a coaxial cable which has a minimum number of component parts arranged in a manner suitable for rapid production, and which is a compact, neat appearing, low cost, versatile, rugged and durable unit.

With the foregoing and other objects in view, all of which hereinafter appear, my invention comprises certain constructions, combinations and arrangements of parts and elements as hereinafter described, defined in the appended claims and illustrated in preferred embodiment in the accompanying drawings, in which:

FIGURE 1 is a longitudinal cross section of a coupling constructed according to the invention, using a nut type connector.

FIGURE 2 is an end portion of a coaxial cable, partly broken away to show the interior thereof, which is prepared for use with the coupling of FIG. 1.

FIGURE 3 is a longtiudinal section of the cable of FIG. 2 attached to the coupling of FIG. 1, showing further the organization as being attached to a conventional mounting stub wherein the cable conductor is affixed to a connective device and showing further a fragment of an instrument panel to which the mounting is attached.

FIGURE 4 is a side elevation of a modified embodiment of the coupling using a split sleeve type connector housed within an attachment thimble.

FIGURE 5 is a longitudinal section as taken from the indicated line 5—5 at FIG. 4.

FIGURE 6 is a longitudinal section of an end portion of a coaxial cable, similar to the showing at FIG. 3, but prepared for use with the coupling shown at FIGS. 4 and 5 by the attachment of the jack pin on the conductor wire.

FIGURE 7 is a fragmentary portion, partially in section, showing the attachment of the cable of FIG. 6 to the coupling of FIG. 5.

Referring more particularly to the drawings, the coupling C, illustrated in section at FIG. 1, is formed, gener-

ally, as an axially symmetrical unit having a cylindrical base B with a socket **10** at one end, hereinafter referred to as the trailing end, which is sized to receive the end of a coaxial cable K of the type generally illustrated at FIG. 2. A head H projects from the opposite, leading end, of this base B to carry a connector which, in the construction illustrated at FIGS. 1 to 3, is a nut N. An axial passageway **11** extends through this head to receive a cable core, as will be described. Other components of this coupling C include an axially centered core sleeve **12** within the socket **10**, a thin walled tubular member which forms a continuation of the passageway **11** into the socket **10**, and a pair of lock screws **13** mounted diametrically opposing in tapped holes **14** in the cylindrical wall of the base to project into the socket **10**.

While the components so described and illustrated at FIG. 1 may be formed in various ways to facilitate the manufacture of the unit, a desirable construction from the viewpoint of economy, compactness and ease of assembly contemplates the formation of the head H and sleeve **12** as a unitary tubular member having outer cylindrical sections about the passageway **11** of progressively increasing diameter. The first section, of minimum diameter, will constitute the sleeve **12**. This sleeve, a thin walled member, has an externally chamfered end **15** and a length corresponding to, and preferably slightly less than, the depth of the socket **10**. The second section, a fit section **16**, is adapted to engage an axially centered orifice **17** through the leading end of the cylindrical base with a tight press fit. The third section is a spacer section **18** adapted to carry the nuts N and has a diameter greater than the fit section **16**. This provides a shoulder **19** between the second and third sections to abut against the leading wall of the base B to limit the extent to which the head may be pressed into the base B. The fourth and final section of this head is a flange **20** at the leading end of the head and is adapted to retain the nut N upon the spacer section. The nut N, of conventional construction, is formed as an internally threaded member having an inturned flange **21** at its base which fits upon the spacer section **18**, while the external diameter of the flange **20** fits within the thread socket of the nut N and its leading face forms a seat when the nut is turned upon a tube, as will be described.

This arrangement of components permits a quick, simple assembly of the components forming the coupler C. The nut N is mounted upon the spacer section **18** and the fit section **16** is pressed into the base orifice **17** as a single pressing operation. Placing the lock screws **13** in the orifices **14** completes the assembly of this coupler, and it is to be noted that it has only five separate parts, the base B, the head H, the nut N and the two lock screws **13**.

The coaxial cable K, illustrated at FIG. 2, includes the axial conductor wire **25** which is encased in a tubular plastic insulation core **26** of material such as neoprene, and it is to be noted that this core has a diameter the same as or slightly less than the internal diameter of the core passageway **11** for a sliding fit therein. A braided wire shield **27** embraces this insulation core to form a second conductor, a shield or a ground for the axial wire **25**. This shield **27** is encased within a tubular plastic insulation sheath **28** to complete the coaxial cable structure.

FIGURE 2 shows the manner in which the end of the cable K is prepared for connection with the coupler C, and it is to be noted that the preparation of this cable will require only a pocketknife if no other tools are available. A selected length of the axial wire **25** is exposed at the end of the cable by peeling away the sheath **28**, shield **27** and core **26**. Next, a selected length of the insulation core **26** is exposed by peeling back and cutting away a portion of the sheath **28** and shield **27**. This length of the exposed core **26** will be slightly greater than the length of the head portion, which includes the sections **16** and **18** and the flange **20**, to permit a short length of the core to project from the end of the passageway when the coupler C is connected to the cable, as will be described. It is to be noted that, while the juncture **29** between the wire **25** and the core **26** may be sloped for convenience in cutting, as illustrated, the juncture **30**, between the core **26** and the wire shield **27** and outer insulation sheath **28** is preferably cut to as square a cut as is conveniently possible with an ordinary knife to better fill the socket **10**.

FIGURE 3 illustrates the manner in which the end of the cable K is inserted into the socket **10** with the core **26** extending through the passageway **11** to secure the coupler and cable together. It is to be noted that this insertion is accomplished manually with the core **26** being first threaded into the passageway **11** of the sleeve **12**. When the end of the sleeve contacts the juncture **30** between the core and outer sheath, the chamfered end **15** of the sleeve will spread the shield to permit the sleeve to be pushed under the braided wire shield **27**. This is facilitated because pushing against the shield will tend to compress the braids to enlarge its diameter. When the end of the outer sheath **28** is fully within the socket **10**, and the shield **27** is over the tube, the core **26** will extend completely through the passageway **11** to permit the end of the wire **25** to project therefrom. So inserted, the end of the coaxial cable K is locked onto the coupler C by tightening the opposing lock screws **13** and the cable is then ready to be connected into an instrument or the like.

The nut N is ideally suited to be fitted upon a tubular stub D of the type illustrated at FIG. 3, the stub having a short, tubular body **31** externally threaded at one end to receive the nut N and with a flange **32** at the opposite end to permit the stub to be mounted in an orifice **33** of a panel P, as with bolts **34**. An insulator tube **35** is fitted into this stub body **31**, and this tube includes a passageway **36** which is aligned with the core passageway **11** and which is preferably the same diameter. Accordingly, the end of the axial wire **25** will project into this passageway **36** and is there conveniently contacted and held by a standard type of spring connector **37** which will grip the wire and permit a lead within the panel to be inserted into the passageway **36** to complete the circuit to which the coaxial wire conductor extends.

It is to be noted that with this arrangement, the wire **25** extends through the cable and through the coupler C in an axially centered position, and that at the same time, the woven shield is secured in position upon the sleeve **12** by lock screws **13**. Thus, the shield is not distorted by flattening, and the resulting axially symmetrical construction of the coupler secured to the shield provides for a symmetrical placement of metal about the core to minimize the influences of varying the capacitance about the wire which can be significant when ultra high frequency currents are passing through the wire **25**. Furthermore, the tightening of the set screws against the outer sheath **28**, of the plastic material, will cause sufficient spreading of this sheath to completely fill the socket **10** and render the connection waterproof, a result which can be acomplished only with conventional couplers of a type having connector rings which are squeezed about the cable by a press.

The alternate construction of the coupler C', illustrated at FIGS. 4 through 7, embodies the same construction of a base B, as hereinabove described, a cylindrical member with a socket **10** at its trailing end to receive an end of a coaxial cable K. A modified head H' projects from the leading end of this base to carry a conventional split sleeve connector S and an attachment thimble T about the connector C. The head H' is formed with a shorter axial core passageway **11'** which continues through a thin walled core sleeve **12** within the socket **10** as previously described, while the passageway is substantially enlarged to a socket **50** in the portion of the head constituting the split sleeve and its support. Also, the base B includes lock screws **13** extending in diametrically opposing tapped hole **14** to grip the end of a coaxial cable K, as heretofore described.

The components forming this modified head H' may be advantageously integrated with the sleeve **12** to form a series of cylindrical sections of varying diameter somewhat the same as that heretofore described. The first section will constitute the cylindrical sleeve **12**. The second section, a fit section **16**, having a larger diameter than the sleeve, is adapted to engage an orifice **17** in the leading end of the cylindrical base with a tight press fit, as heretofore described. The third section, a spacer section **18'** yet larger in diameter, provides a shoulder **19** to abut against the leading wall of the base, as heretofore described. The fourth section is a flange **20'** outstanding from the spacer section to retain an enlarged circumferential inner groove **51** of the thimble T, as will be described. A fifth section extends forwardly from the flange to form a leading spacer section **52**, and a sixth section extends forwardly beyond this spacer section to form the split sleeve connector S.

The split sleeve connector S at the leading end of the head H' is a thin walled tubular member having an external circumferential lock bead **53** at its forward edge, and a circumferential array of longitudinal slots **54** to divide the sleeve into segments to permit the segments to move together when the sleeve is pressed into a mounting tube. A conventional mounting tube, not shown, having an internal groove to receive the bead **53**, is adapted to hold the split sleeve within it and to be held within the thimble T and attached thereto by means of suitable lugs on the mounting tube which engage bayonet slots **55** in the thimble.

The connection of the thimble to the head H' is at the enlarged internal groove **51** at the trailing end of the thimble. This groove **51** fits upon the flange **20'** and is resiliently and rotatably mounted thereon and restrained by spring washers **56** at each side of the flange **20'**. The outer end of the groove **51** is closed by a washer **57**, and the inner, forward end of the groove **51** is closed by a filler washer **58**. Each washer **57** and **58** bears against a spring washer **56** to limit the movement of the thimble on the head.

When the thimble is properly mounted upon the head H', the fit section **16** of the head may then be pressed into the socket **17** of the base to complete the assembly, as by using a mandrel which will fit into the socket **50** formed in the leading end of the head. This socket **50** extends into the head to a position opposite the spacer section **18'** and is adapted to receive a cylindrical insulator **59** which has a sectioned passageway through it. The passageway includes a major cavity **60** at its leading end where a connection means with other components may be fitted, a smaller intermediate passageway **61** to receive the base of a jack pin and a trailing cavity **62** which forms a continuation of the core passageway **11**.

This insulator is adapted to receive a specially prepared jack connector pin **63** which is mounted upon the end of the wire conductor **25**, as in the manner illustrated at FIG. 6. This cable K is prepared by exposing a portion of the wire conductor **25**, exposing a portion of the insulation core **26**, but with the core cuts **29'** and **30'** being squared and suitably spaced for fitting into the jack connector pin **63** as illustrated at FIG. 7. An insulated heat resistant bushing **64** is threaded upon the wire portion **25** and the tubular head **65** of a jack connector pin **63** is threaded upon the end of this wire and soldered into position, as through a solder hole **66** extending through the side of the head **65**. When soldered in position, as indicated at FIG. 6, the assembly of the cable K to the coupler C' is by threading the jack connector pin **63** and the insulation core **26** into the passageway **11** followed by pushing the outer sheath **28** into the socket **10** with the shield **27** fitting over the sleeve **12**. The coupler cable is then secured into position by the lock screws **13** and is ready for use. Properly mounted, the jack connector pin **63** lies within the major cavity **60** of the insulator **59**, its head **65** lies within the intermediate passageway **61**, and the insulator bushing **64** lies within the trailing cavity **62**.

While I have now described selected embodiments of my invention in considerable detail, it is obvious that others skilled in the art can devise and build alternate and equivalent constructions which are within the spirit and scope of my invention.

I claim:

1. A coupling for a coaxial cable of the type having an axial conductor within an insulation core, a braided metal shield about the core, and an outer insulation sheath about the shield, comprising:

(a) a base formed as a generally axially symmetrical unit having a socket at one end adapted to receive the end of the cable;

(b) a tubular sleeve within the socket formed as a comparatively thin walled member having a passageway sized to receive the insulation core of the cable;

(c) a coupling connector at the end of the base opposite the socket, with said passageway extending into this coupling connector whereby a reach of the insulation core of the cable may be extending through the sleeve, through the base, and into the coupling connector; and

(d) opposing lock screws in tapped holes in the wall of the base extending into the socket adapted to grip the outer insulation sheath of the cable whenever the cable is moved into the socket with the insulation core being within the passageway, and the metal shield about the sleeve, whereby pressure against the outer insulation sheath locks the shield upon the sleeve.

2. In the organization defined in claim **1** including a head on the base opposite the socket, and wherein said coupling connector comprises a nut secured to the head.

3. In the organization defined in claim **1** including a head on the base opposite the socket, and wherein said coupling connector comprises a split sleeve extension of the head.

4. In the organization defined in claim **1** including a head on the base opposite the socket, and wherein said head and said sleeve are formed as a unitary member as cylindrical segments about the passageway extending therethrough, one segment including the sleeve and a segment adjacent thereto including a fitting segment, and wherein said base includes an orifice through its end adapted to receive the fitting segment with a tight press fit.

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U.S. Cl. X.R.

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