

[54] SNAP-IN CONTACT ASSEMBLY FOR PLUG AND JACK TYPE CONNECTORS

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[58] Field of Search 339/59, 177, 182, 183, 339/205, 213, 217, 18 B, 125, 126

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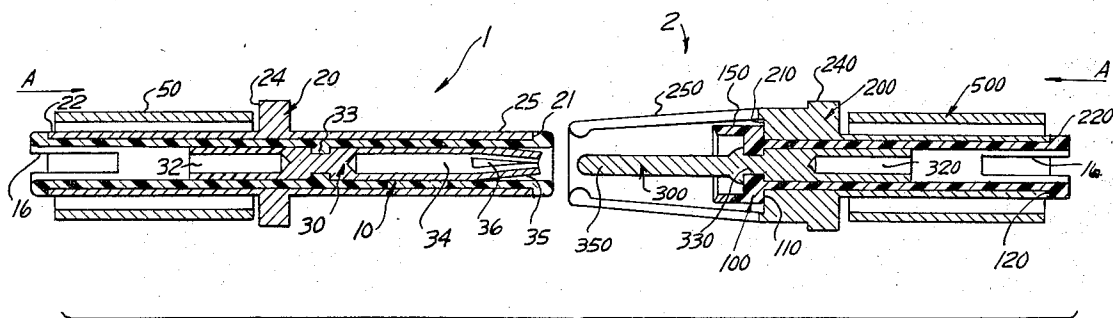
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[57]

ABSTRACT

A plug or jack type electrical connector that includes a snap-in contact and insulator assembly so that the insulator and/or contact may be removed from the plug or jack for maintenance and/or replacement. The insulator is a plastic sleeve that contains a separable electrical contact, the sleeve being separably mounted within the plug or jack housing.

7 Claims, 3 Drawing Figures



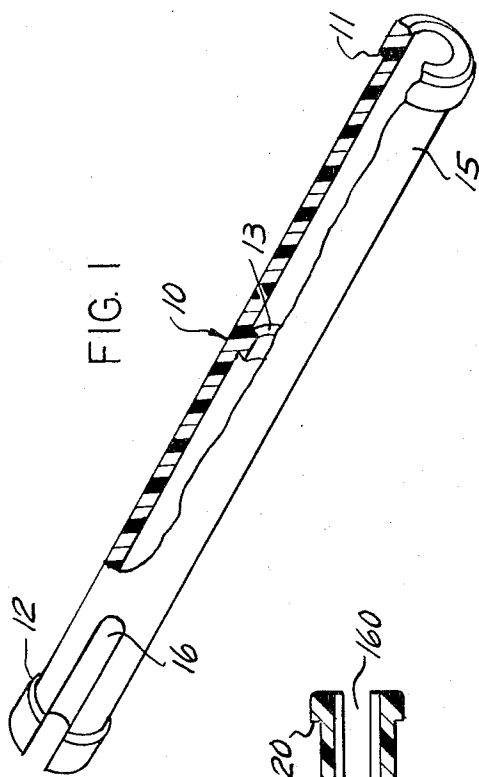


FIG. 1

FIG. 2

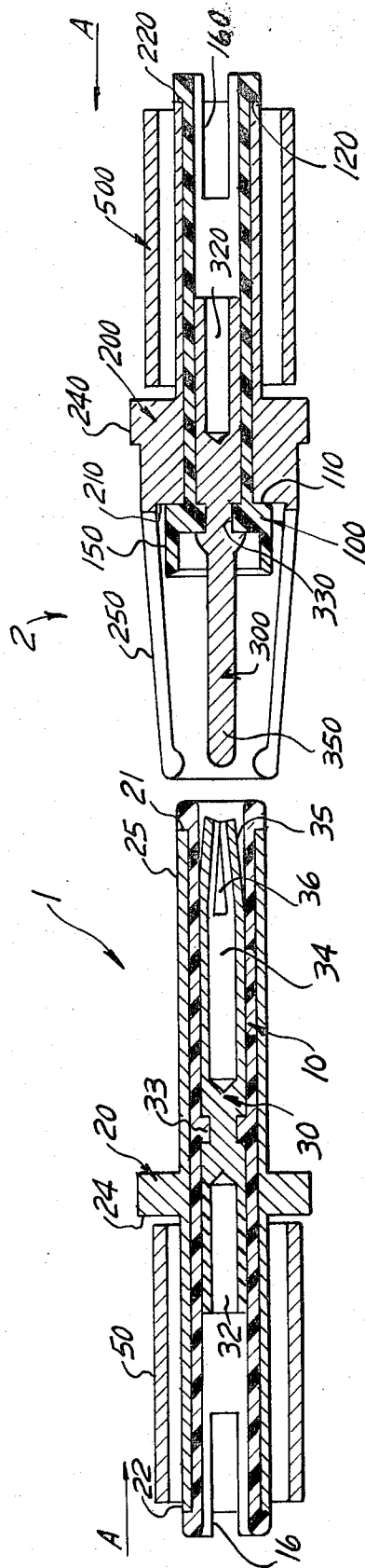
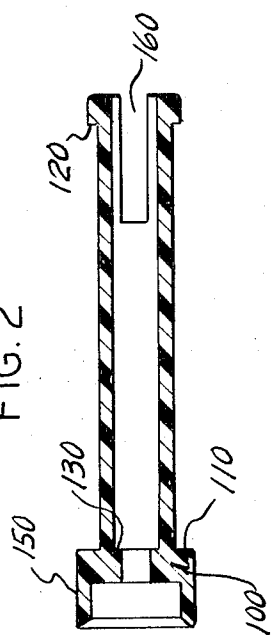


FIG. 3

SNAP-IN CONTACT ASSEMBLY FOR PLUG AND JACK TYPE CONNECTORS

BACKGROUND OF THE INVENTION

This invention relates to coaxial type electrical connectors which include a mateable plug and jack. This invention is more particularly related to a snap-in contact assembly within the plug and/or jack.

Electrical connectors for coaxial cables are well known in the art and may be seen in U.S. Pat. No. 3,229,241 entitled "Electrical Connectors for Coaxial Cable" issued Jan. 11, 1966 to D. Kao; and 3,196,382 entitled "Crimp-Type Coaxial Cable Connector" issued July 20, 1965 to W. Morello, Jr. Plug and jack type coaxial cables of the aforementioned type generally include a complex structure which is difficult to repair and/or replace the contacts and/or other component parts thereof. Therefore, it has been the practice in the past to simply replace the defective plug or jack assembly rather than attempt to repair or replacement of a defective part. In many instances, the insulator between the center contact and the outer contact because of some defect or injury failed to isolate these two electrical conductors one from another and therefore rendered the energized plug and/or jack inoperable. Further, the use of plug and jack type connectors for small diameter coaxial cables (e.g., RG 178 and RG 196) that utilize male pin type contacts having a diameter of about 0.015 inches has been impeded by the fact that existing plug and jack type connectors cannot be merely scaled down without having mechanical strength problems and electrical insulation problems.

SUMMARY OF THE INVENTION

This invention provides a simple and inexpensive snap-in contact and insulator assembly for a miniaturized plug or jack of a coaxial cable connector.

The invention is a coaxial cable plug or jack type connector that is characterized by a metal contact (30) that snaps into a plastic sleeve (10) which snaps into a metal housing (20), the plastic sleeve (10) being removable from the housing (10) by compressing one end of the plastic sleeve (10) that includes an axial slot (16) therein.

One embodiment of the invention includes in combination with a coaxial cable connector of the type having a cylindrical housing (20) that includes; a central passage, a forward mating portion (25) and a rear portion; an electrical contact (30) having a wire receiving end (32), an opposite mating end (35), and a recess (33) in the outside of the contact (30); and an insulator (10) mounted in the housing central passage and disposed to retain the contact (30) within but electrically insulated from the housing (20), the improvement wherein the insulator comprises: a sleeve (10) comprised of electrically nonconducting material, the sleeve having a forward end portion (15); a rear end portion; an axial slot (16) in the rear end portion so that the rear end portion of the sleeve is radially compressible; a first rearwardly facing shoulder (11) on the front portion of the sleeve that engages the front end (21) of the housing (20); a second forwardly facing shoulder (12) on the rear end that engages the rear end (22) of the housing (20), so that the engagement of the shoulders (11, 12) with the end (21, 22) of the housing (20) prevents axial movement of the sleeve (10); and

an internal projection (13) in said sleeve (10) that extends into the recess (33) in the contact (30) to prevent axial movement of the contact (30) mounted within the sleeve (10) whereby the sleeve (10) and the contact (30) may be removed from the housing (20) by radially compressing the rear portion of the sleeve (10) so that the forwardly facing shoulder (12) on the rear portion of the sleeve disengages the rear end (22) of the housing (20) to permit removal of the sleeve (10) from the forward mating portion (25) of the housing (20).

Accordingly, it is an object of this invention to provide a coaxial cable connector with a simple snap-in insulator and contact assembly.

It is another object of this invention to provide a miniaturized coaxial connector assembly for use with small diameter coaxial cables such as types RG 178, RG 196 or equivalent.

It is still another object of this invention to provide a miniature type plug and jack type connector assembly for a coaxial cable that has good mechanical strength and electrical isolation.

It is another object of this invention to provide a coaxial cable connector assembly of simple and inexpensive construction.

The above and other objects and features of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings and claims which form a part of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a snap-in insulator sleeve used in one-half of the connector assembly illustrated in FIG. 3.

FIG. 2 illustrates a snap-in insulator used in the other half of the connector assembly illustrated in FIG. 3.

FIG. 3 illustrates a plug and jack type electrical connector assembly that accomplishes the objects of this invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an insulating sleeve (10) used in accomplishing the objects of this invention. The insulating sleeve (10) may be comprised of any electrically nonconducting material such as plastic, or polytetrafluoroethylene. The sleeve (10) has a forward end (15) that includes a first rearwardly facing shoulder (11) and a rear end that includes a second forwardly facing shoulder (12). Located in the rear end portion is one or more axial slots (16) that makes the rear end portion radially compressible. Located within the sleeve passage is one or more enlarged portions (13) which are operative to engage a recess in an electrical contact (not shown). This particular sleeve is adapted to be used in one half of a plug and jack type electrical connector shown in FIG. 3.

FIG. 2 illustrates an insulating sleeve (100) that accomplishes the same objects as the insulating sleeve (10) illustrated in FIG. 1 but is designed for the other half of the coaxial cable connector. The insulating sleeve (100) is comprised of any suitable nonconducting material and includes a forward enlarged portion (150) that includes a first external rearwardly facing shoulder (110) and a rear portion that includes a second external forwardly facing shoulder (120). One or more axial slots (160) located in the rear portion of the

sleeve (100) make the rear portion of the sleeve (100) radially compressible. The sleeve (100) includes at least one internal enlarged portion (130) adapted to engage a recess in a contact (not shown) which mates with the contact retained by the first sleeve (10) in FIG. 3.

FIG. 3 illustrates a plug and jack type electrical connector in an unmated position. The plug and jack type electrical connector is used for coaxial type electrical cables (not shown). Coaxial type electrical connectors are well known in the art and generally include a first inner conductor surrounded by a dielectric material which is then surrounded by a braided electrical conductor which is further surrounded by an outer dielectric material.

The first half (1) of the electrical connector assembly includes a metal housing (20), an electrical contact (30), an insulating bushing (10) which retains the metal contact (30) within the housing (20), and a ferrule (50) for securing the coaxial cable (not shown) to the housing (20).

The housing (20) includes a forward mating portion (25), a rear portion that terminates in a rear end (22) and a radially extending flange (24) for locating the ferrule (50) on the housing (20).

Located within the housing (20) is the insulating sleeve (10). The insulating sleeve (10) is retained within the housing (20) by engagement of the rearward facing shoulder (11) of the plastic sleeve (10) that engages the housing forward end (21) and the forwardly facing shoulder (12) of the sleeve (10) that engages the rear end (22) of the housing (20).

Disposed within the insulating sleeve (10) is a female socket type contact (30). The socket contact (30) includes a forward portion (34) having a mating end portion (35) that includes one or more axial slots (36) therein so that the forward mating end (35) of the contact (30) is radially expandable to receive a male pin-type contact in pressurized contact. The socket contact (30) includes a bore (32) for receiving the bared end of the center conductor of a coaxial cable and an external recess (33) for locating and retaining the contact (30) within the insulating sleeve (10) by receiving the internal projection (13) of the insulating sleeve (10). The contact (30) is therefore retained within the insulating sleeve (10) which is secured within the housing (20).

The second half (2) of the coaxial cable electrical connector assembly includes a metal housing (200), an electrical contact (300), an insulating sleeve (100) for retaining the contact within the housing (200), and a ferrule (500) for securing one end of a coaxial cable (not shown) to the connector housing (200).

The connector housing (200) includes a forward mating portion (250) which receives the forward portion (25) of the other half of the connector assembly; a flange (240) for locating the ferrule (500); an internal shoulder (210) which engages the rearwardly facing shoulder (110) of the plastic sleeve (100); and a rear end (220) which engages the second forwardly facing shoulder (120) of the sleeve (100).

The contact (300) is a pin-type contact mateable with the socket contact (30) of the other half (1) of the connector assembly. The male pin-type contact (300) includes a rear portion (320) having a bore therein that receives a bared end of a center conductor of coaxial cable (not shown) and an external recess (330) for re-

ceiving the enlarged portion (130) of the insulating sleeve (100). Therefore, the contact (300) is mounted within the insulating sleeve (100) which is retained within the housing (200) by engagement of the insulating sleeve shoulders (110, 120) with the internal shoulder (210) and one end (220) of the housing (200).

OPERATION

Referring now to FIG. 3, the advantages and objects of this invention may be accomplished as follows. Both halves (1, 2) of the connector assembly contain contacts (30, 300) and insulating sleeves (10, 100) that are separable from their respective housings (20, 200). To remove the contact (30) and insulating sleeve (10) from the housing (20), the rear portion of the sleeve (10) that includes the forwardly facing shoulder (12) is depressed radially inwardly so that the shoulder (12) disengages the rear end (22) of the housing (20). By applying an axial force in the direction of the arrow A by either pushing the insulating bushing (10) from the rear or pulling the insulating bushing (10) from the front, the sleeve may be withdrawn from the forward end (25) of the housing (20). The sleeve (10) may include in addition to the axial slot (16), one or more axial slots in the opposite end so that the sleeve (10) may be removed from either end of the housing (20).

Similarly, the contact (300) may be removed from the housing (200) by applying a force to the rear end of the insulating sleeve (100) that includes the forwardly facing shoulder (120). Application of a radially inward force to the rear end compresses the rear end of the sleeve (100) and disengages the forwardly facing shoulder (120) of the sleeve from the rear end (220) of the housing (200). By applying an axial force in the direction of the arrow A by either pulling or pushing the sleeve (100) in the direction of the arrow, the contact (300) and sleeve (100) may be removed from the forward mating end (250) of the housing (200).

Removal of the sleeves (10, 100) or contacts (30, 300) from the housings (20 or 200) allows for repair or replacement thereof and therefore, the invention is especially useful with coaxial type cables wherein the ferrule (50) is not crimped but is forced on the rear end of the housing to retain the cable by pressure contact rather than deformation.

While a preferred embodiment of the invention has been disclosed, it will be apparent to those skilled in the art that changes may be made to the invention as set forth in the appended claims and, in some instances, certain features of the invention may be used to advantage without corresponding use of other features. For example, the connector assembly may only include one snap-in type insulator in one half of the connector but not the other half. Accordingly, it is intended that the illustrative and descriptive materials herein be used to illustrate the principles of the invention and not to limit the scope thereof.

Having described the invention, what is claimed is:

1. In combination with a coaxial cable connector of the type having: a cylindrical housing that includes a central passage, a forward mating portion, and a rear portion; an electrical contact having a wire receiving end, an opposite mating end, and a recess in the outside of said contact; and an insulator mounted in said housing central passage and disposed to retain said contact

within but electrically insulated from said housing, the improvement wherein the insulator comprises:

a sleeve comprised of electrically nonconducting material surrounding the entire electrical contact, said sleeve having a forward end portion, a rear end portion, an axial slot in said rear end portion so that said rear end portion of said sleeve is radially compressible, a first rearwardly facing shoulder on said front portion of said sleeve that engages the front end of said housing, a second forwardly facing shoulder on said rear end that engages the rear end of said housing, so that the engagement of said shoulders with said ends of said housing prevents axial movement of said sleeve and an internal projection in said sleeve that extends into the recess in said contact to prevent axial movement of said contact mounted within said sleeve whereby said sleeve and said contact may be removed from the front of said housing by radially compressing said rear portion of said sleeve so that said forwardly facing shoulder on said rear portion of said sleeve disengages the rear end of said housing to permit removal of said sleeve from the forward mating portion of said housing.

2. The combination as recited in claim 1 wherein said insulator is comprised of plastic.

3. In combination with a coaxial cable connector of the type having; a cylindrical housing that includes a central passage, a forward mating portion, and a rear portion; an electrical contact having a wire receiving end, an opposite mating end, and a recess in the outside of said contact; and an insulator mounted in said housing central passage and disposed to retain said contact within but electrically insulated from said housing, the improvement wherein the insulator comprises:

a rigid sleeve comprised of electrically nonconducting material surrounding the entire electrical contact, said sleeve having a forward end portion, a rear end portion, an axial slot in one end portion so that said end portion having said slot is radially compressible, a first rearwardly facing shoulder on said front portion of said sleeve that engages the front end of said housing, a second forwardly facing shoulder on said rear end that engages the rear end of said housing, so that the engagement of said shoulders with said ends of said housing prevents axial movement of said sleeve and an internal projection in said sleeve that extends into the recess in said contact to prevent axial movement of said contact mounted within said sleeve whereby said sleeve and said contact may be removed from said housing by radially compressing said end portion of said sleeve having said slots so that said shoulder on said rear portion of said sleeve disengages the end of said housing to permit removal of said sleeve from said housing passage.

4. In combination with a coaxial cable connector of the type having; a cylindrical housing that includes a central passage, a forward mating portion, and a rear portion; an electrical contact having a wire receiving end, an opposite mating end, and a recess in the outside of said contact; and an insulator mounted in said housing central passage and disposed to retain said contact within but electrically insulated from said housing, the improvement wherein the insulator comprises:

a sleeve comprised of electrically nonconducting material surrounding the entire electrical contact, said

sleeve having a forward end portion; a rear end portion; releasable means for preventing axial movement of said sleeve, mounted in said housing, with respect to said housing; means for preventing axial movement of said contact, mounted with said sleeve, with respect to said sleeve; and means operable to release said means that prevents axial movement of said sleeve with respect to said housing whereby said sleeve and said contact may be removed from said housing by operation of said releasing means, said releasable means for preventing axial movement of said sleeve including at least one axial slot in one of the end portions of said sleeve so that said sleeve end portion is radially compressible and means for latching onto said housing when said sleeve is not compressed, said latching means operable to disengage said housing upon radial compression of said compressible end portion of said sleeve whereby said sleeve and contact may be removed from said housing.

5. An electrical connector member for attachment to an end of a coaxial cable having a center electrical conductor, an inner dielectric layer surrounding the center conductor, a flexible tubular outer conductor surrounding the dielectric layer, and an outer electrically insulating layer surrounding said outer conductor, said connector member comprising:

a tubular shell of electrically conducting material having a forward mating portion and a rear cable receiving portion;

an electrically conducting contact member having a forward mating portion and a rear conductor receiving portion adapted to be attached to a bared end of said coaxial cable center conductor, said contact member having at least one recess in the outside surface thereof; and

an electrically insulating sleeve having a forward portion, a rear contact receiving portion, a first external rearwardly facing shoulder on said forward portion, a second external forwardly facing shoulder on said rear portion, at least one internal projection that mates with said at least one external recess in said contact member, and at least one axial slot in said rear portion of said sleeve so that said rear portion is compressible, said second shoulder on said rear portion of said sleeve engaging said rear end of said housing and said first shoulder on said forward end of said sleeve engaging the forward end of said housing so that said sleeve is held captive within said housing by operation of said shoulders engaging said housing ends, and said contact is completely surrounded by and is held within said sleeve by operation of said recess in said contact which receives said internal projection of said sleeve whereby said sleeve and said contact are retained in said housing and may be withdrawn from said housing by compressing the rear portion of said sleeve which disengages said second forwardly facing shoulder on the sleeve from the rear end of the housing to allow removal of the sleeve and contact from the housing.

6. In combination with a coaxial cable connector of the type having; a cylindrical housing that includes a central passage, a forward mating portion having an internal forwardly facing shoulder, and a rear portion; an electrical contact having a wire receiving end, an opposite mating end, and a recess in the outside of said

contact; and an insulator mounted in said housing central passage and disposed to retain said contact within but electrically insulated from said housing, the improvement wherein the insulator comprises:

a rigid sleeve comprised of electrically nonconducting material, said sleeve having a forward enlarged end portion from which said contact mating end extends; a rear end portion surrounding and extending beyond said wire receiving end of said contact; an axial slot in said rear end portion so that said rear end portion of said sleeve is radially compressible; a first rearwardly facing shoulder on said front end portion that engages the internal shoulder of said housing; a second forwardly facing shoulder on said rear end portion that engages the rear end of said housing, so that the engagement of said sleeve second shoulder with said rear end of said housing and engagement of said sleeve first shoulder with said housing internal shoulder prevents axial movement of said sleeve; and an internal projection in said sleeve that extends into the recess in said contact to prevent axial movement of said contact mounted within said sleeve whereby said sleeve and said contact may be removed from the front of said housing by radially compressing said rear portion of said sleeve so that said forwardly facing shoulder on said rear portion of said sleeve disengages the rear end of said housing to permit removal of said sleeve from the forward mating portion of said housing.

7. An electrical connector member for attachment to an end of a coaxial cable having: a center electrical conductor, an inner dielectric layer surrounding the center conductor, a flexible tubular outer conductor surrounding the dielectric layer, and an outer electrically insulating layer surrounding said outer conductor, said connector member comprising:

a tubular shell of electrically conducting material having a forward mating portion that includes an

internal forwardly facing shoulder and a rear cable receiving portion;

an electrically conducting contact member having a forward mating portion and a rear conductor receiving portion adapted to be attached to a bared end of said coaxial cable center conductor, said contact member having at least one recess in the outside surface thereof; and

an electrically insulating sleeve having an enlarged forward portion from which said contact extends, a rear contact receiving portion surrounding and extending beyond said conductor receiving portion of said contact member, a first external rearwardly facing shoulder on said forward portion, a second external forwardly facing shoulder on said rear portion, at least one internal projection that mates with said at least one external recess in said contact member, and at least one axial slot in said rear portion of said sleeve so that said rear portion is compressible and said sleeve is removable from the front of said shell when the rear portion of said sleeve is compressed, said second shoulder on said rear portion of said sleeve engaging said rear end of said housing and said first shoulder on said forward end of said sleeve engaging the internal shoulder in the forward portion of said housing so that said sleeve is held captive within said housing by operation of said shoulders and said contact is held within said sleeve by operation of said recess in said contact which receives said internal projection of said sleeve whereby said sleeve and said contact are retained in said housing and may be withdrawn from said housing by compressing the rear end of said sleeve which disengages said second forwardly facing shoulder of the sleeve from the rear end of the housing to allow removal of the sleeve and contact from the housing.

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