(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 March 2010 (18.03.2010)

PCT

(10) International Publication Number
WO 2010/031020 A1

(51) International Patent Classification:
H02G 1/12 (2006.01) *H01R 43/28* (2006.01)

(21) International Application Number:
PCT/US2009/056896

(22) International Filing Date:
15 September 2009 (15.09.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/210,548 15 September 2008 (15.09.2008) US

(71) Applicant *(for all designated States except US)*: **COMMSCOPE, INC. OF NORTH CAROLINA** [US/US]; 1100 Commscope Place, SE, Hickory, NC 28603 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **VACCARO, Ronald, A.** [US/US]; 3240 14TH Street Circle NE, Hickory, NC 28601 (US).

(74) Agents: **REGAN, Christopher, F.** et al.; 255 S. Orange Ave, Suite 1401, Orlando, FL 32802-3791 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: COAXIAL CABLE END PREPARATION TOOL WITH DRIVE SHAFT AND RELATED METHODS

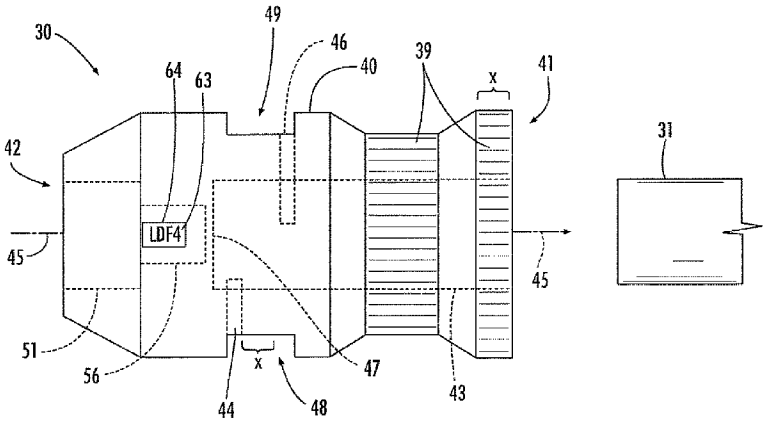


FIG. 1

(57) **Abstract**: A cable end preparation tool is for a coaxial cable including an inner conductor, a dielectric layer surrounding the inner conductor, an outer conductor surrounding the dielectric layer, and an outer jacket surrounding the outer conductor. The tool may include a body having first and second opposing ends with a first recess in the first end and a second recess in the second end. A first blade may be carried within the first recess for stripping the outer jacket to expose a portion of the outer conductor when the body is rotated about the coaxial cable. A second blade may be carried within the first recess for stripping the outer conductor and dielectric layer to expose a portion of the inner conductor when the body is rotated relative to the coaxial cable. The tool may also include a coring bit having a cutting head and a drive shaft extending outwardly therefrom.

WO 2010/031020 A1

COAXIAL CABLE END PREPARATION TOOL WITH DRIVE SHAFT AND RELATED METHODS

Field of the Invention

[0001] The present invention relates to the field of cables and connectors, and, more particularly, to coaxial cable end preparation tools and related methods.

Background of the Invention

[0002] Coaxial cable is an electrical cable that includes an inner conductor surrounded by an insulating dielectric layer or spacer, which is in turn surrounded by an outer cylindrical conductor. A protective outer jacket typically surrounds the outer conductor. A coaxial cable provides protection of signals from external electromagnetic interference, and effectively guides signals with low emission along the length of the cable.

[0003] One particular application for coaxial cables is in cellular base station or tower installations. Large, industrial grade coaxial cables and connectors are used to connect the telephone network communication equipment located at the bottom of the cell tower with the antenna array positioned at the top of the tower. In a typical cell tower installation, there are usually at least a dozen connectors that are required, and in larger installations several dozen connectors are not uncommon.

[0004] Installation of coaxial cable connectors requires that a technician cut and prepare the coaxial cable ends at the appropriate location to mount the connector thereon. In particular, the cable end preparation requires removal of the outer jacket to expose a portion of the outer conductor, as well as removal of the outer conductor and dielectric layer to expose a portion of the inner conductor. Moreover, the exposed portion of the outer conductor may also require flaring. However, performing these operations can be difficult given the diameter of commercial grade coaxial cable, and the use of knives or other basic cutting tools with exposed blades causes a significant risk of injury to the technician. Moreover, a technician may be required to install connectors while at the top a cell tower, which compounds the difficulties of preparing a cable end with basic cutting tools.

[0005] As a result, various cable preparation tools have been developed to make coaxial cable end preparation easier for installation technicians. One such example is set forth in U.S. Patent No. 6,668,459 to Henningsen. This patent describes stripping tools for coaxial cables with a corrugated outer conductor and a hollow inner conductor. The tool includes three main parts: a jacket cutting part for removing a certain predetermined length of the jacket of the cable, a guide part to be placed around the end of the cable after the jacket has been removed by the jacket cutting part, and a second cutting part to be placed on the guide part during a final preparation of the end of the cable during which the inner conductor, the outer conductor and the dielectric material between inner and outer conductor are cut to appropriate lengths. The guide part is provided with a portion for determining a well-defined longitudinal position of the tool on the cable relative to the pattern of valleys and crests of the corrugation on the outer conductor.

[0006] An exemplary cable flaring tool is described in U.S. Patent No. 7,059,162 to Tarpill et al. The flaring tool is for flaring the outer conductors of two different sizes of coaxial cable, and it includes a dome-shaped body and a reversible tool head. The tool head has first and second shafts and first and second flaring heads on opposite sides. Reversing the tool head exposes the shaft and flaring head for the corresponding size of coaxial cable. The shafts match the inner diameter of the inner conductor of the coaxial cable to be flared. The flaring heads are shaped as half cones, which allow the outer conductor to be flared without deforming the insulation between the inner and outer conductors of the coaxial cable.

[0007] Despite the existence of such stripping and flaring tools, further advancements in coaxial cable end preparation tools and methods may be desirable. For example, tools such as those noted above may only be compatible with a particular type of coaxial cable, such as those with a corrugated outer conductor or those with a straight (i.e., non-corrugated) outer conductor. Moreover, tools that can be used either with or without the assistance of a power driver, such as a cordless drill, may also be helpful to technicians.

Summary of the Invention

[0008] In view of the foregoing background, it is therefore an object of the present invention to provide a cable end preparation tool for coaxial cables and related methods.

[0009] This and other objects, features, and advantages are provided by a cable end preparation tool for a coaxial cable including an inner conductor, a dielectric layer surrounding the inner conductor, an outer conductor surrounding the dielectric layer, and an outer jacket surrounding the outer conductor. The cable end preparation tool may include a body having first and second opposing ends with a first recess in the first end and a second recess in the second end. A first blade may be carried within the first recess for stripping the outer jacket to expose a portion of the outer conductor when the body is rotated about the coaxial cable. Moreover, a second blade may be carried within the first recess for stripping the outer conductor and dielectric layer to expose a portion of the inner conductor when the body is rotated relative to the coaxial cable. The tool may also include a coring bit comprising a cutting head and a drive shaft extending outwardly therefrom. More particularly, the cutting head when positioned in the second recess may be for rotating the body based upon rotation of the drive shaft, and when out of the second recess for removing the dielectric layer between the inner conductor and the exposed portion of the outer conductor based upon rotation of the drive shaft.

[0010] In addition, the cutting head may have a predetermined shape for flaring the exposed portion of the outer conductor when the body is rotated relative to the coaxial cable. Moreover, the cutting head may have a central opening therein for receiving the exposed inner conductor. By way of example, the cutting head and the second recess may be rectangular. Also, the drive shaft may have a plurality of flat sections thereon, and the drift shaft and the cutting head may be threadably connected. Additionally, the cutting head may have marking indicia thereon, and the body may have an indicia reading opening therein aligned with the marking indicia. The first and second blades may be removably mounted to the body. Further, the body may have a cylindrical shape. Also, the body may comprise plastic, for example. Further, the body may have a visual indicator on an exterior surface thereof corresponding to a longitudinal spacing between the first and second blades.

[0011] A cable end preparation method for a coaxial cable may include providing a cable end preparation tool, such as the one described briefly above, positioning the coaxial cable in the first recess, and positioning the cutting head in the second recess. The method may further include rotating the drive shaft to rotate the body relative to the coaxial cable to strip the outer jacket to expose a portion of the outer conductor using the first blade, and to strip the outer conductor and dielectric layer to

expose a portion of the inner conductor using the second blade. In addition, the cutting head may be removed from the second recess and positioned on the coaxial cable, and the drive shaft may be rotated so that the cutting head removes the dielectric layer between the inner conductor and the exposed portion of the outer conductor.

Brief Description of the Drawings

[0012] FIG. 1 is a side view of a cable end preparation tool in accordance with the invention.

[0013] FIG. 2 is a perspective view of the tool of FIG. 1.

[0014] FIG. 3 is a perspective view of corrugated and non-corrugated coaxial cables with exposed inner and outer conductor portions after preparation with the tool of FIG. 1.

[0015] FIG. 4 is an end view of the tool of FIG. 1 showing a coring bit thereof.

[0016] FIG. 5 is an end view of the tool of FIG. 4 with the coring bit removed to show a coring bit recess.

[0017] FIG. 6 is a top perspective view of an alternative embodiment of the tool of FIG. 1 including a coring bit with a drive shaft and cutting head.

[0018] FIGS. 7 and 8 are side views of the coring bit of FIG. 6 before and after connection of the removable drive shaft to the cutting head, respectively.

[0019] FIGS. 9 and 10 are flow diagrams illustrating method aspects of the using the cable end preparation tools of FIGS. 1 and 6, respectively.

[0020] FIG. 11 is a side view of an alternative embodiment of the cable end preparation tool of FIG. 1.

Detailed Description of the Preferred Embodiments

[0021] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout, and prime notation is used to indicate similar elements in alternative embodiments.

[0022] Referring initially to FIGS. 1-5, a cable end preparation tool **30** for a coaxial cable **31** is first described. Two main types of industrial coaxial cables are typically

used in applications such as cellular tower installations, for example, which include a corrugated coaxial cable **31a** and non-corrugated or smooth wall coaxial cable **31b** (FIG. 3). The coaxial cables **31a**, **31b** respectively include an inner conductor **32a**, **32b**, a dielectric layer **33a**, **33b** surrounding the inner conductor, an outer conductor **34a**, **34b** surrounding the dielectric layer, and an outer jacket **35a**, **35b** surrounding the outer conductor. The difference between the two cables **31a**, **31b** is that the outer conductor **34a** is corrugated, while the outer conductor **34b** is not. By way of example, typical sizes of coaxial cables for telecommunications applications include 1/2 inch, 7/8 inch, 1-1/4 inch, and 1-5/8 inch, and the tool **31** may be sized for use with these and other sizes of cables.

[0023] Reference herein to any of the foregoing coaxial cable components without an "a" or "b" suffix means that the tool **30** may be used with either. For example, when it is said that the tool **30** strips the outer jacket **35** from the outer conductor **34**, this means that either the outer jacket **35a** or **35b** can be stripped from the outer conductor **34a** or **34b** using the tool, depending upon which type of cable is being used in the given installation. Also, while the tool **30** is described herein by way of example for use with cellular tower cable installations, it will be appreciated that the tool may be used for cable end preparation in other applications as well.

[0024] The cable end preparation tool **30** illustratively includes a body **40** having first and second opposing ends **41**, **42**. In the illustrated example the body **40** is cylindrical, but other body shapes may also be used in different embodiments. The body **40** may be made from a variety of materials, such as metal, wood, and plastic, for example, using common manufacturing techniques known to those skilled in the art. The body **40** further illustratively includes a plurality of raised surface gripping features **39** thereon (knurls in the illustrated embodiment) to help facilitate gripping by the user, although a variety of textured surfaces or other gripping features (e.g., dimples, grooves, etc.) may also be used, if desired, but gripping features are not required in all embodiments. The second end **42** is tapered in the exemplary embodiment, but it need not be tapered in all embodiments.

[0025] A first recess **43** is in the first end **41** of the body **40**, and a first blade **44** is carried by the body and extends within the first recess **43** for stripping the outer jacket **35** to expose a portion of the outer conductor **34** when the body is rotated relative to the coaxial cable **31**. By way of example, the first recess **43** may be sized according to the diameter of the coaxial cable **31**. That is, the first recess **43** may

have a diameter that is slightly larger than the diameter of the cable **31**. When the technician places the cable **31** within the first recess **43**, he may then rotate the body **40** about a longitudinal center axis **45** thereof while also pushing the body toward the cable, which causes the first blade **44** to strip or cut the outer jacket off of the outer conductor **34**, as seen in FIG. 3.

[0026] A second blade **46** is illustratively carried by the body **40** and also extends within the first recess **43** for stripping the outer conductor **34** and dielectric layer **33** to expose a portion of the inner conductor **32** when the body is rotated relative to the coaxial cable **31**. The exposed portion of the inner conductor **32** extends outwardly beyond the exposed portion of the outer conductor **34** as shown perhaps best in FIG. 3. Again, the stripping occurs when the user rotates the body **40** by hand and pushes the body toward the cable **31**. The user pushes and rotates the body **40** until the exposed portion of the inner conductor **32** contacts a bottom **47** of the first recess **43**. That is, the bottom **47** and first blade **44** may be set at the proper spacing so that the bottom provides a stop to make the exposed outer conductor **34** portion the desired length for the given coaxial connector to be connected to the cable **31**. Likewise, the second blade **46** may also be set relative longitudinally to the first blade **44** to provide the appropriate length for the exposed inner conductor portion **32**.

[0027] In accordance with another advantageous aspect, an exterior surface portion of the tool **30** may also provide or have a visual guide or indicator thereon to indicate to the technician when the proper stripping depth for the cable **31** has been reached. More particularly, a lip or rim **65** of the first end **41** is illustratively set to a width **x**, which is the same width as the longitudinal spacing or distance between the first and second blades **44**, **46**. In other words, when the cable **31** bottoms out in the first recess **43**, the width of the exposed inner conductor **32** will be equal to the width of the lip **65**. Thus, the technician can simply remove the cable **31** from the first recess **43** and position the exposed inner conductor **32** next to the lip **65** to see if they are the same width, meaning that stripping is complete.

[0028] It should be noted that the first and second blades **44**, **46** need not necessarily strip all of the outer jacket **35** and dielectric layer **33** from the outer conductor **34** and inner conductor **32**, respectively, in all embodiments. That is, a small or residual amount of jacket and/or dielectric material may remain on the outer/inner conductors **34**, **32**, which typically may be cleaned off by hand or which may be small enough not to interfere with connector attachment/conductivity. The

body **40** also illustratively includes first and second blade access openings **48**, **49** for the first and second blades **44**, **46**, respectively, which not only allow cuttings to exit the first recess **43**, but also allow the first and second blades to be removed and/or replaced in certain embodiments, if desired.

[0029] The tool **30** also illustratively includes a coring bit **50** carried by the second end **42** of the body **40** for removing a portion of the dielectric layer **33** between the inner conductor **32** and the exposed portion of the outer conductor **34** when the body is rotated relative to the coaxial cable **31**. In the illustrated embodiment, the coring bit **50** is carried within a second recess **51** in the second end **42** of the body **40**. Like the first recess **41**, the second recess **51** is sized according to the coaxial cable size and provides a guide for insertion and steadying the tool **30** on the cable end so that the user may again push the body **40** toward the cable **31** and rotate or twist it about the central axis **45**. This also keeps the coring bit **50** recessed within the body **40** so that it does not accidentally scrape other objects or the technician. However, the coring bit **50** need not be recessed within the body **40** in all embodiments.

[0030] The coring bit **50** illustratively includes a cutting head **52** comprising teeth **53** for removing the dielectric material **33** as the bit is rotated, similar to a drill bit. The teeth **53** are also tapered on their sides **54** which, as the teeth progress inside the outer conductor **34**, cause the outer conductor to flare outwardly, as will be appreciated by those skilled in the art. A back nut connector (not shown), which is used to screw the prepared cable end to a corresponding coaxial plug, etc., is typically placed on the cable **31** after stripping and before flaring with the coring bit **50**, as will be appreciated by those skilled in the art. The tapered sides **54** flatten out to a stopping point as shown so that the cutting head **52** will stop progressing once the appropriate flaring and depth have been achieved. However, it should be noted that flaring may not be required in certain implementations depending upon the given cable and connector type, and thus in such applications the tapered sides **54** would not be required, as will also be appreciated by the skilled artisan.

[0031] The cutting head **52** also has a central opening **55** therein for receiving the exposed inner conductor **32**. The central opening **55** therefore provides a guide for insertion of the exposed inner conductor **32** into the cutting head **52**, and thereby helps align the cutting head for removal of the dielectric layer **33** and flaring of the outer conductor **34**. In the illustrated embodiment, the body **40** also has a coring bit recess **56** within the second recess **51** for receiving the coring bit **50**, which is

centered on the central axis **45** of the body (see FIG. 5). In the present example, the coring bit **50** and the coring bit recess **56** are rectangular (here square), although other shapes may also be used. Use of a coring bit recess **56** configuration advantageously allows different sizes/shapes of coring bits to be interchanged in the body **40** for different applications. For example, one bit style may be for corrugated cables **31a**, while another bit style may be for smooth wall cables **31b**, and different bit sizes may be used for cables of different conductor diameters, as will be appreciated by those skilled in the art. A set screw **60** may also be inserted through a threaded hole in the body **40** to contact the coring bit **50** and hold it securely in place, although this need not be used in all embodiments.

[0032] In some embodiments the first end **42** and depth of the coring bit recess **56** may be configured such that an edge or other indicator on the body **40** is aligned with either a marking on the cable **31** or on the back nut when the proper coring depth has been achieved. That is, the technician will turn the body **40** until the edge/indicator on the body is in alignment with the edge/indicator on the cable/back nut, indicating that the coring/flaring operation is complete. However, such a configuration need not be used in all embodiments.

[0033] Turning now to FIGS. 6-8, an alternative embodiment of the cable end preparation tool **30'** is advantageously suited for use with a power driver, such as a cordless drill, for example. In this regard, the tool **30'** illustratively includes a coring bit **50'** including a cutting head **52'** and a drive shaft **61'** extending outwardly therefrom. More particularly, the cutting head **52'** when positioned in the coring bit recess **56'** may advantageously be used to rotate the body **40'** based upon rotation of the drive shaft **61'**. In the illustrated embodiment, the drive shaft or shank **61'** has a plurality of flat sections or flats **62'** thereon, which in this example is three flats to define a triangular shank. This allows the drive shaft to be securely fastened within the chuck of a cordless drill, for example, as will be appreciated by those skilled in the art. However, other types of shanks may also be used, such as brace shanks, straight shanks, and hex shanks, for example, as will also be appreciated by those skilled in the art.

[0034] When the coring bit **50'** is removed or taken out of the coring bit recess **56'**, the cutting head **52'** may then be used for removing the dielectric layer **33** between the inner conductor **32** and the exposed portion of the outer conductor **34** based upon rotation of the drive shaft **61'**. That is, with the drive shaft **61'** still in the drill

chuck, the cutting head **52** is removed from the body **40'** and the central opening **55'** therein is positioned on the exposed portion of the inner conductor **32** as an alignment guide for dielectric removal/flaring, as discussed above. The drive shaft **61'** and the cutting head **52'** may be threadably connected, as shown in FIGS. 7 and 8, although in some embodiments they may be made as a unitary piece, or may otherwise be connected (e.g., by a recess in the cutting head **52'** that slidably engages the drive shaft **61'**, etc.).

[0035] As such, it will be appreciated that different coring bits **50'** (or cutting heads **52'**) may also advantageously be interchangeably used for different cable types/sizes. To this end, it may also be advantageous to include marking indicia **63'** on the cutting heads **52'** to identify the respective types/sizes of coaxial cable **31** they are intended to be used with. In the illustrated example, the marking indicia on the cutting head **52'** is "LDF4." As shown in the embodiment of FIG. 1, an indicia reading opening **64** may also advantageously be included in the body **40** that is aligned with the marking indicia **63** when the cutting head **52** is inserted in the coring bit recess **56**, which allows the user to see which bit is in the body without the need to loosen the set screw **60** to remove the cutting head to view the marking indicia. This feature may be used with both the handheld tool embodiment **30** and the power tool embodiment **30'**.

[0036] It will also be appreciated that with a removable drive shaft **61'**, the coring bit **50'** may advantageously be used with a same body **40** as either a handheld tool (i.e., without the drive shaft) or as a power driven tool (i.e., with the drive shaft attached and connected to a drill chuck). Moreover, even with a unitary coring bit where the drive shaft **61'** is not removable from the cutting head **52'**, an additional recess or hole may be used so that the coring bit **50'** can be inserted "backwards" (i.e., drive shaft first), and thereby still used as a hand tool without a drill. That is, the drive shaft recess would have a smaller diameter than the coring bit recess **56'** and would extend deeper into the body **40'** so that the drive shaft **61'** extends into the first recess **43'**, leaving the cutting head positioned in the coring bit recess as shown in FIG. 4.

[0037] Referring now to FIG. 9, a cable end preparation method using the cable end preparation tool **30** begins (Block **90**) withpositioning the coaxial cable **31** in the first recess **43** and rotating the body **40** relative to the coaxial cable to strip the outer jacket **35** to expose a portion of the outer conductor **34** using the first blade **44**, and

to strip the outer conductor and dielectric layer **33** to expose a portion of the inner conductor **32** using the second blade **46**, at Block **91**. The back nut may be positioned on the stripped cable **31** at this time, as discussed above. The method further illustratively includes positioning the coring bit **50** on the coaxial cable **31** and rotating the body **40** relative to the coaxial cable so that the coring bit removes a portion of the dielectric layer **33** between the inner conductor **32** and the exposed portion of the outer conductor **34** (Block **92**), and optionally flares the outer conductor, as discussed above, thus concluding the illustrated method (Block **93**).

[0038] Turning additionally to FIG. 10, a related method for using the cable end preparation tool **30'** begins at Block **100** with positioning the coaxial cable **31** in the first recess **43'**, and positioning the cutting head **52'** in the coring bit recess **56'**, at Blocks **101-102** (although positioning of the cutting head could be performed earlier or later). The method further illustratively includes rotating the drive shaft **61'** to rotate the body **40'** relative to the coaxial cable **31** to strip the outer jacket **35** to expose a portion of the outer conductor **34** using the first blade **44**, and to strip the outer conductor and dielectric layer **33** to expose a portion of the inner conductor **32** using the second blade **46**, at Block **103**. Here again, the back nut may be positioned on the stripped cable **31** at this time. In addition, the cutting head **52'** may be removed from the coring bit recess **56'** and positioned on the coaxial cable **31**, and the drive shaft **61'** rotated so that the cutting head removes the dielectric layer **33** between the inner conductor **32** and the exposed portion of the outer conductor **34** (Blocks **104-105**), and optionally flares the outer conductor, as discussed further above, thus concluding the illustrated method (Block **106**).

[0039] Referring additionally to FIG. 11, another embodiment of the cable end preparation tool **30''** illustratively includes first and second holes **68''**, **69''** positioned between the coring bit recess **56''** and first recess **43''**, which advantageously may be used to apply leverage by the technician for rotation of the body **40''**. That is, the technician may insert one or more levers, such as screw drivers, for example, through the holes **68''**, **69''** to provide handles and a greater turning radius for rotating the body **40''** and, thus, better leverage, as will be appreciated by those skilled in the art. In the illustrated example, the first and second holes **68''**, **69''** are perpendicular to one another and pass through the entire body **40''**. The first and second holes **68''**, **69''** are also perpendicular to the longitudinal center axis **45''** of the body **40''**. However, other numbers of holes (e.g., a single hole) may be used in

some embodiments, and the holes need not pass all the way through the body **40''** as shown in all embodiments. This feature may be particularly useful for handheld versions of the tool **30''** in relatively large sizes, e.g., such as for 1-1/4 inch and 1-5/8 inch sizes, where more force may be required by the technician to turn the body, although it may be used with power driven versions of the tool and different sizes of the tool as well.

[0040] Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is understood that the invention is not to be limited to the specific embodiments disclosed, and that modifications and embodiments are intended to be included within the scope of the appended claims.

THAT WHICH IS CLAIMED IS:

1. A cable end preparation tool for a coaxial cable comprising an inner conductor, a dielectric layer surrounding the inner conductor, an outer conductor surrounding the dielectric layer, and an outer jacket surrounding the outer conductor, the cable end preparation tool comprising:

a body having first and second opposing ends with a first recess in the first end and a second recess in the second end;

a first blade carried within the first recess for stripping the outer jacket to expose a portion of the outer conductor when said body is rotated about the coaxial cable;

a second blade carried within the first recess for stripping the outer conductor and dielectric layer to expose a portion of the inner conductor when said body is rotated relative to the coaxial cable; and

at least one coring bit comprising a cutting head and a drive shaft extending outwardly therefrom;

said cutting head when positioned in the second recess for rotating said body based upon rotation of said drive shaft, and when out of the second recess for removing the dielectric layer between the inner conductor and the exposed portion of the outer conductor based upon rotation of said drive shaft.

2. The cable end preparation tool of Claim 1 wherein said cutting head has a predetermined shape for flaring the exposed portion of the outer conductor when said body is rotated relative to the coaxial cable.

3. The cable end preparation tool of Claim 1 wherein said cutting head has a central opening therein for receiving the exposed inner conductor.

4. The cable end preparation tool of Claim 1 wherein said cutting head and the second recess are rectangular.

5. The cable end preparation tool of Claim 1 wherein said drive shaft has a plurality of flat sections thereon.

6. The cable end preparation tool of Claim 1 wherein said drift shaft and said cutting head are threadably connected.

7. The cable end preparation tool of Claim 1 wherein said cutting head has marking indicia thereon; and wherein said body has an indicia reading opening therein aligned with the marking indicia.

8. The cable end preparation tool of Claim 1 wherein said first and second blades are removably mounted to said body.

9. The cable end preparation tool of Claim 1 wherein said body has a cylindrical shape.

10. The cable end preparation tool of Claim 1 wherein said body comprises plastic.

11. The cable end preparation tool of Claim 1 wherein said body has a visual indicator on an exterior surface thereof corresponding to a longitudinal spacing between said first and second blades.

12. A cable end preparation tool for a coaxial cable comprising an inner conductor, a dielectric layer surrounding the inner conductor, an outer conductor surrounding the dielectric layer, and an outer jacket surrounding the outer conductor, the cable end preparation tool comprising:

a body having first and second opposing ends with a first recess in the first end and a second recess in the second end;

a first blade carried within the first recess for stripping the outer jacket to expose a portion of the outer conductor when said body is rotated about the coaxial cable;

a second blade carried within the first recess for stripping the outer conductor and dielectric layer to expose a portion of the inner conductor when said body is rotated relative to the coaxial cable; and

at least one coring bit comprising a cutting head and a drive shaft extending outwardly therefrom;

said cutting head when positioned in the second recess for rotating said body based upon rotation of said drive shaft, and when out of the second recess for removing the dielectric layer between the inner conductor and the exposed portion of the outer conductor based upon rotation of said drive shaft;

said cutting head having a predetermined shape for flaring the exposed portion of the outer conductor when said body is rotated relative to the coaxial cable, and having a central opening therein for receiving the exposed inner conductor.

13. The cable end preparation tool of Claim 12 wherein said cutting head and the second recess are rectangular.

14. The cable end preparation tool of Claim 12 wherein said drive shaft has a plurality of flat sections thereon.

15. The cable end preparation tool of Claim 12 wherein said drive shaft and said cutting head are threadably connected.

16. The cable end preparation tool of Claim 12 wherein said cutting head has marking indicia thereon; and wherein said body has an indicia reading opening therein aligned with the marking indicia.

17. A cable end preparation method for a coaxial cable comprising an inner conductor, a dielectric layer surrounding the inner conductor, an outer conductor surrounding the dielectric layer, and an outer jacket surrounding the outer conductor, the method comprising:

providing a cable end preparation tool comprising a body having first and second opposing ends with a first recess in the first end and a second recess in the second end, first and second blades carried within the first recess, and at least one coring bit comprising a cutting head and a drive shaft extending outwardly therefrom;

positioning the coaxial cable in the first recess;

positioning the cutting head in the second recess;

rotating the drive shaft to rotate the body relative to the coaxial cable to strip the outer jacket to expose a portion of the outer conductor using the first blade, and to strip the outer conductor and dielectric layer to expose a portion of the inner conductor using the second blade;

removing the cutting head from the second recess; and

positioning the cutting head on the coaxial cable and rotating the drive shaft so that the cutting head removes the dielectric layer between the inner conductor and the exposed portion of the outer conductor.

18. The method of Claim 17 wherein the cutting head has a predetermined shape for flaring the exposed portion of the outer conductor when the body is rotated relative to the coaxial cable.

19. The method of Claim 17 wherein the cutting head has a central opening therein; and wherein positioning the cutting head comprises positioning the central opening to receive the exposed inner conductor.

20. The method of Claim 17 wherein the cutting head and the second recess are rectangular.

21. The method of Claim 17 wherein the drive shaft has a plurality of flat sections thereon.

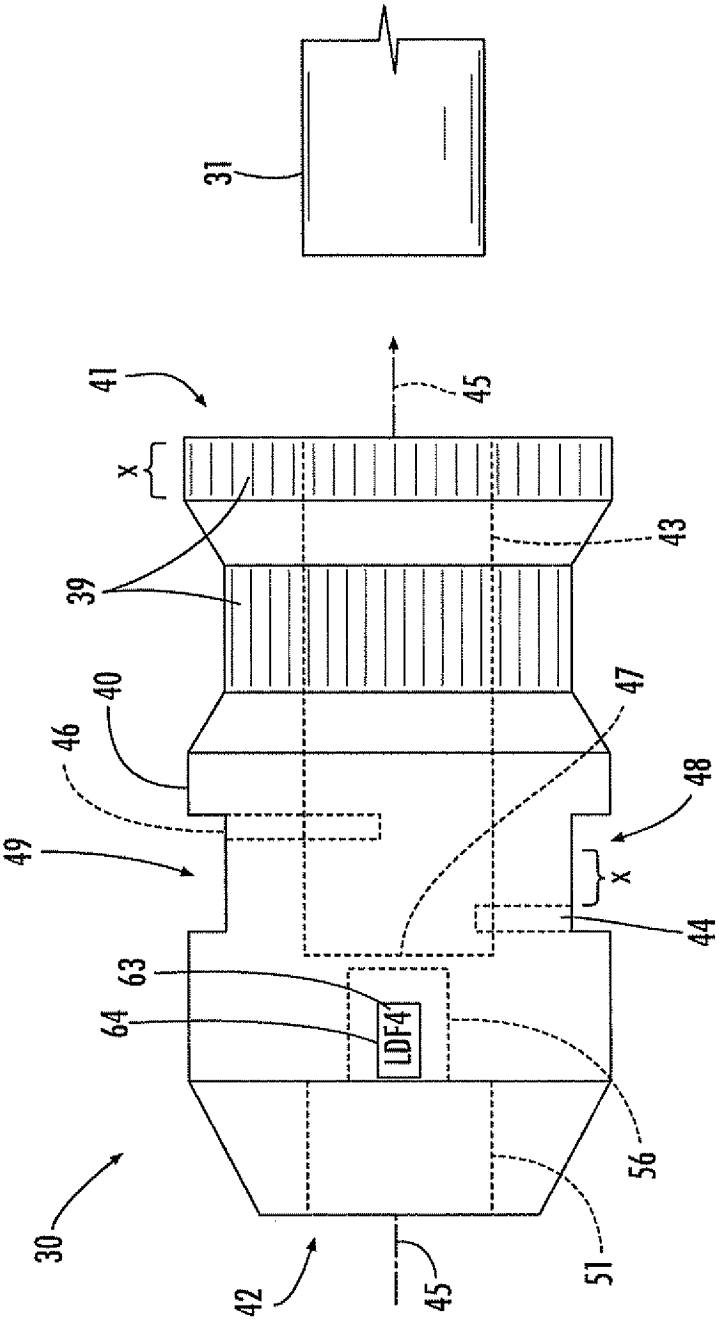


FIG. 1

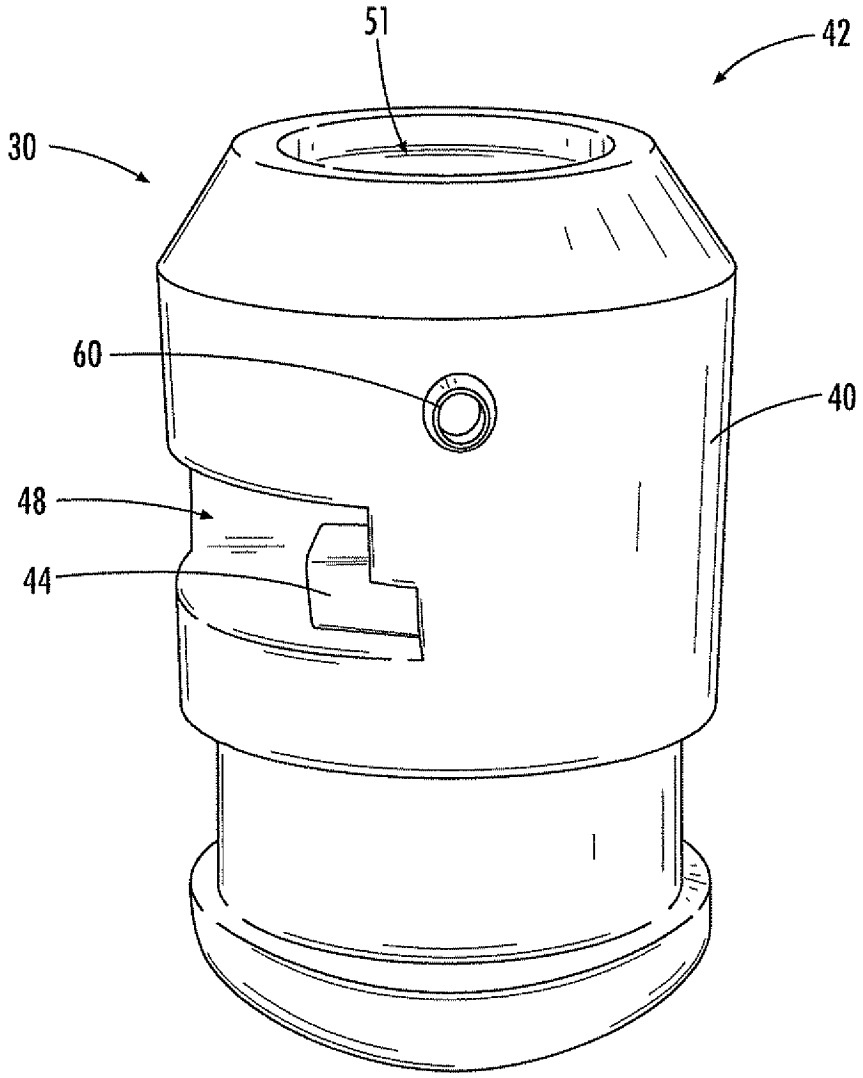


FIG. 2

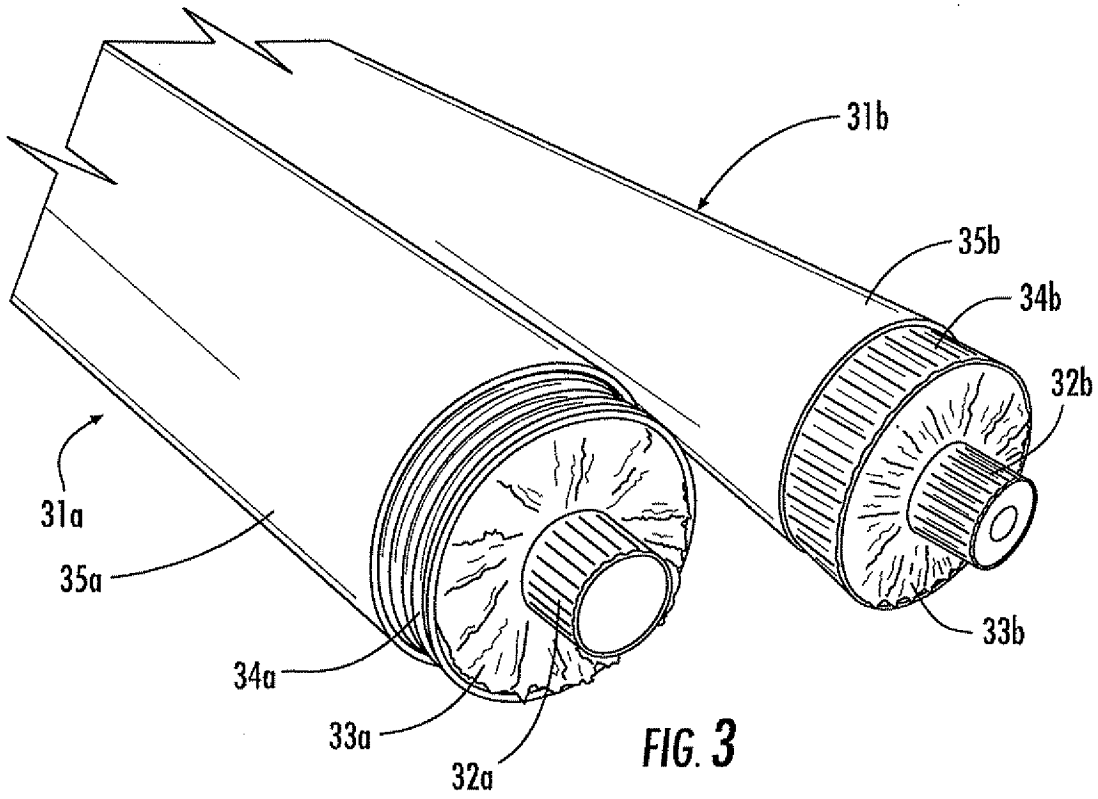


FIG. 3

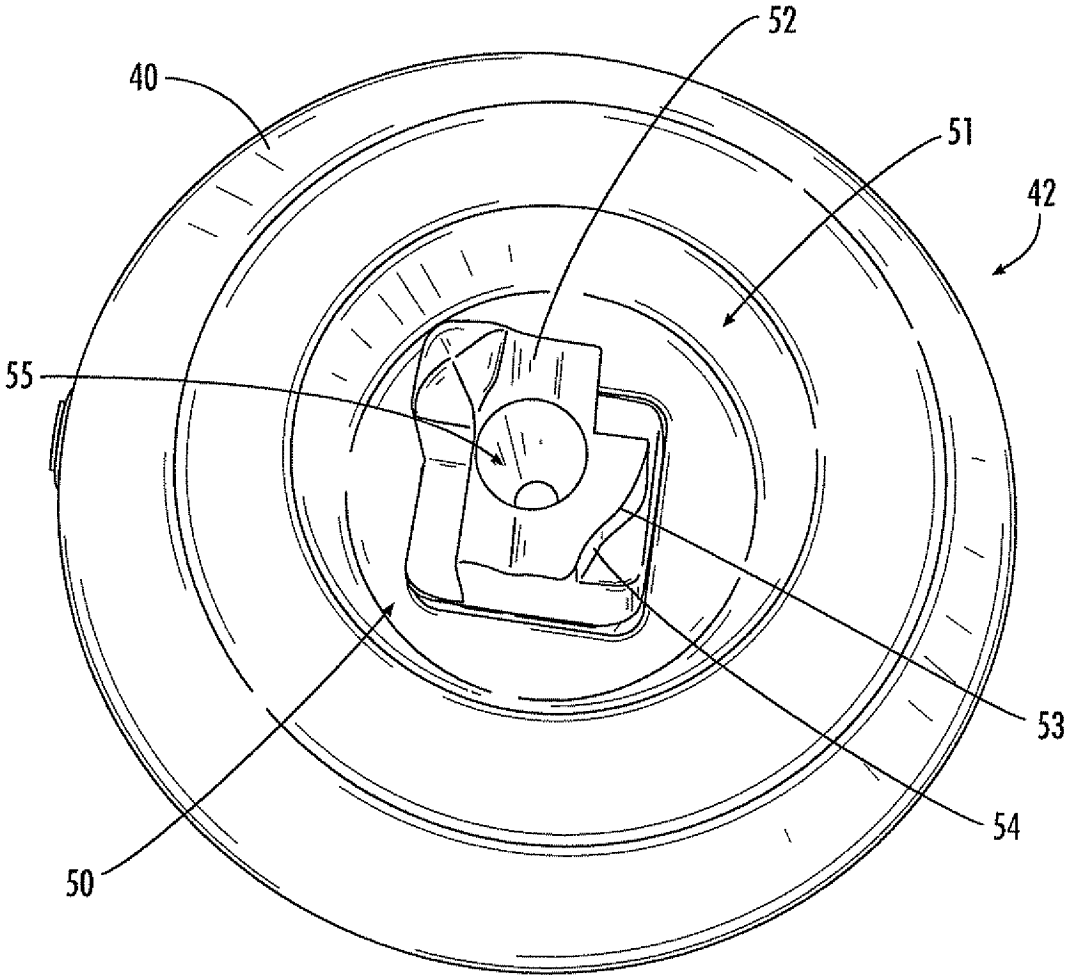


FIG. 4

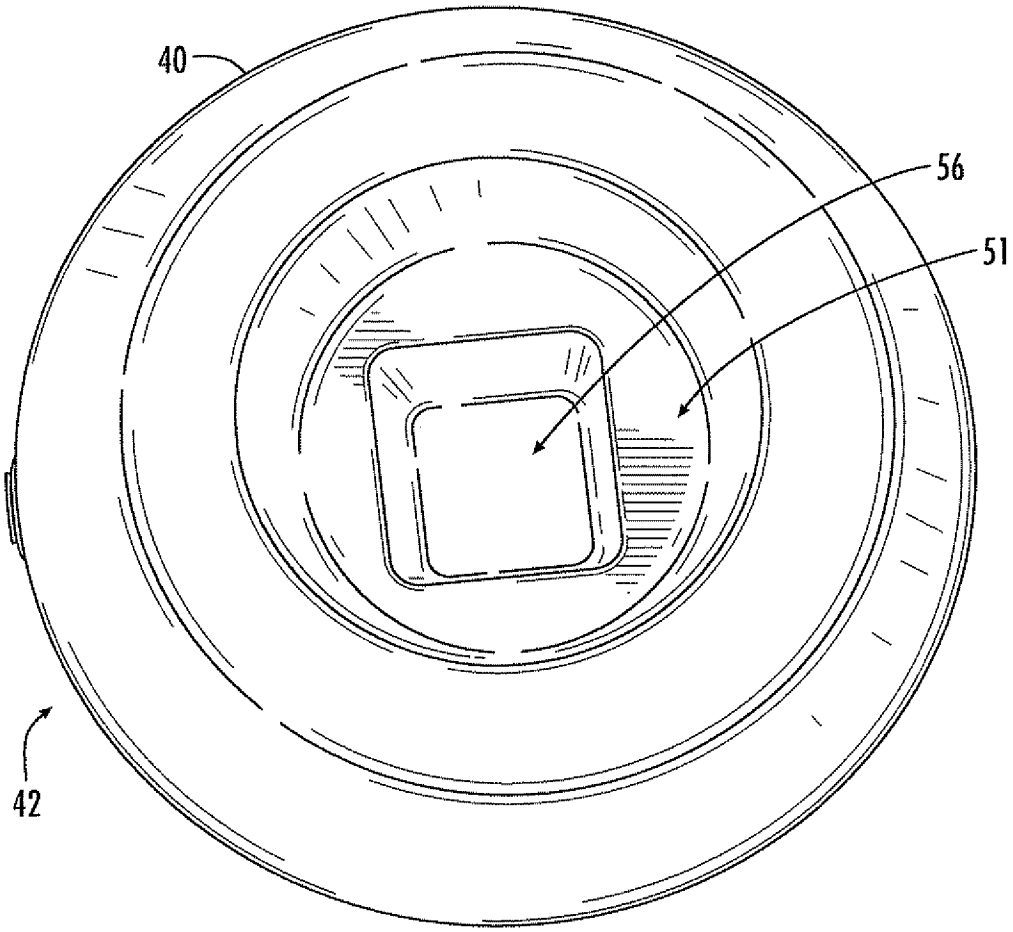


FIG. 5

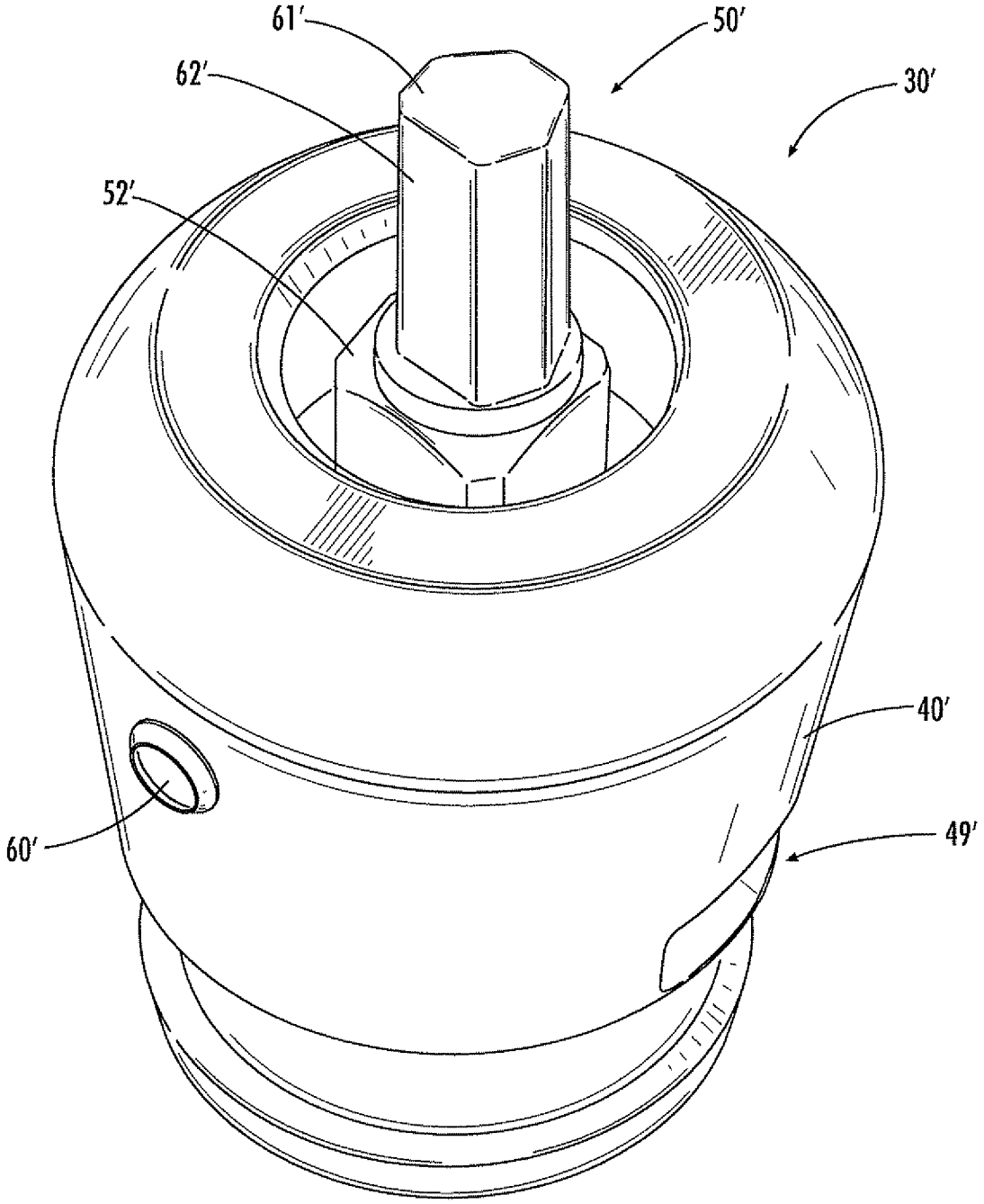


FIG. 6

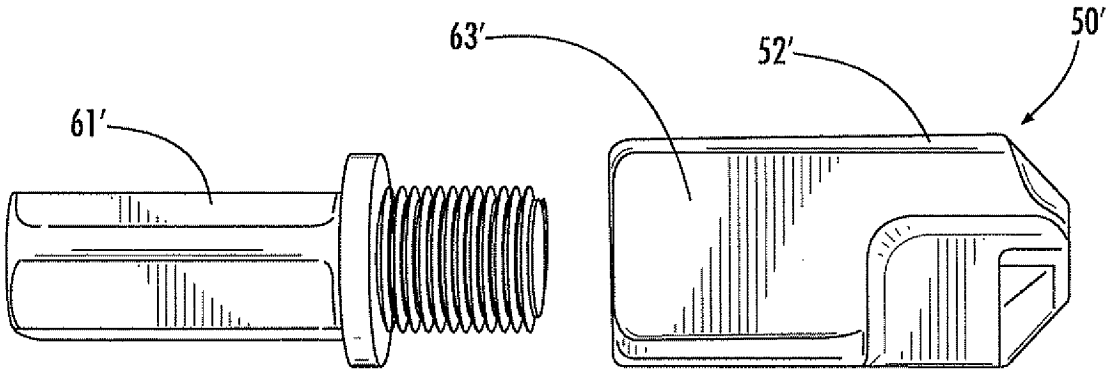


FIG. 7

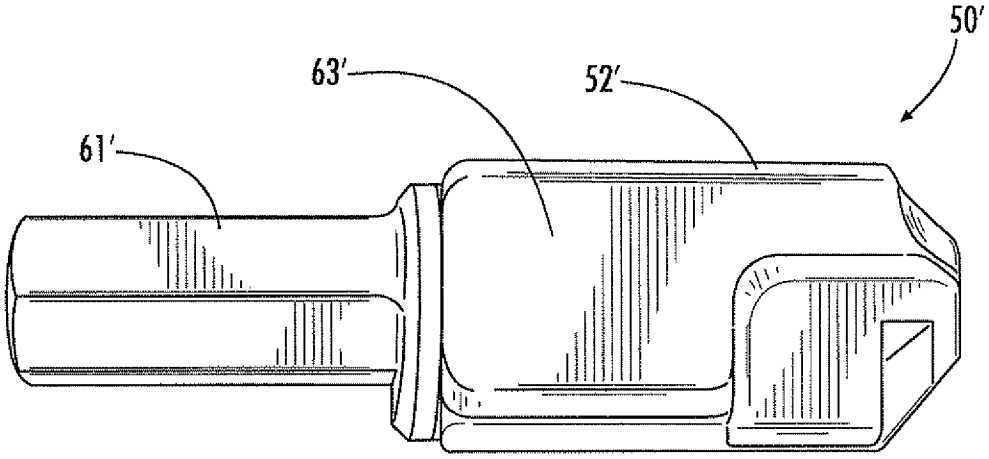


FIG. 8

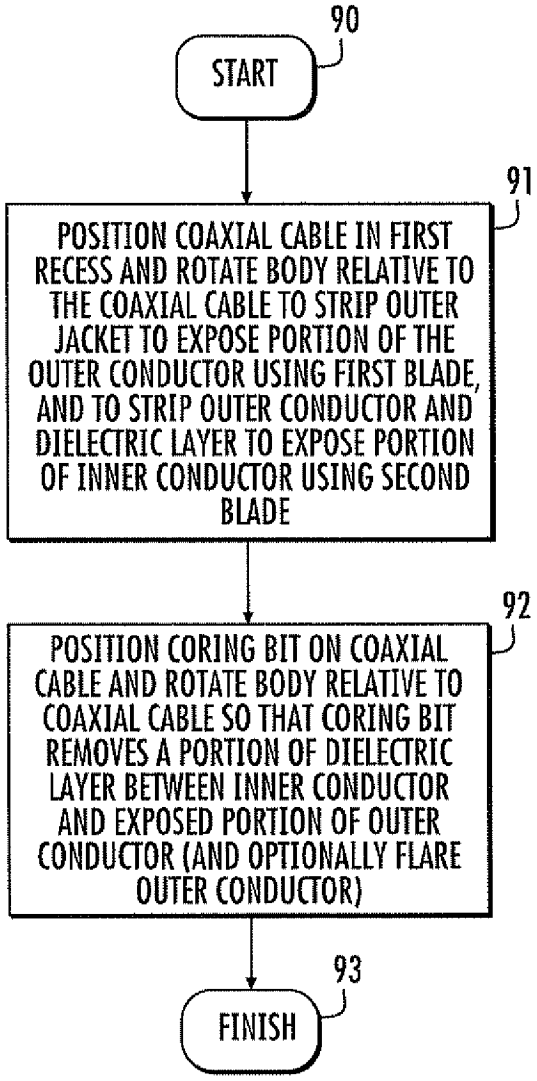

90
START
91
POSITION COAXIAL CABLE IN FIRST RECESS AND ROTATE BODY RELATIVE TO THE COAXIAL CABLE TO STRIP OUTER JACKET TO EXPOSE PORTION OF THE OUTER CONDUCTOR USING FIRST BLADE, AND TO STRIP OUTER CONDUCTOR AND DIELECTRIC LAYER TO EXPOSE PORTION OF INNER CONDUCTOR USING SECOND BLADE
92
POSITION CORING BIT ON COAXIAL CABLE AND ROTATE BODY RELATIVE TO COAXIAL CABLE SO THAT CORING BIT REMOVES A PORTION OF DIELECTRIC LAYER BETWEEN INNER CONDUCTOR AND EXPOSED PORTION OF OUTER CONDUCTOR (AND OPTIONALLY FLARE OUTER CONDUCTOR)
93
FINISH

FIG. 9

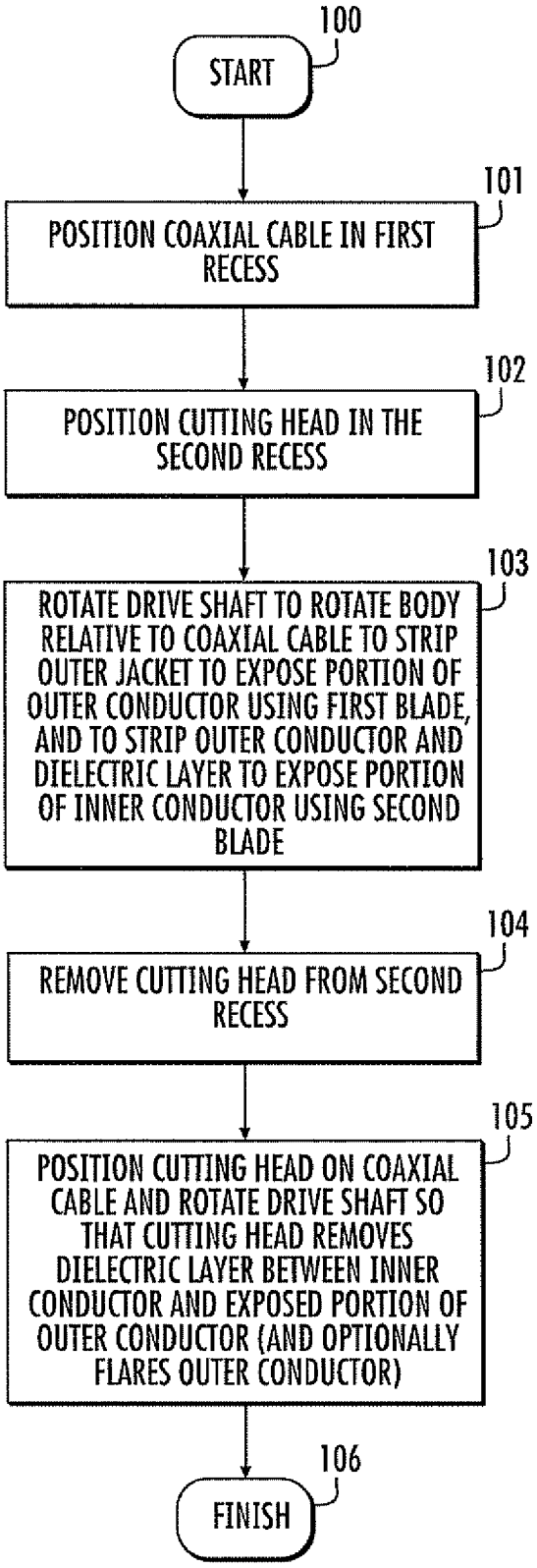

100
START
101
POSITION COAXIAL CABLE IN FIRST RECESS
102
POSITION CUTTING HEAD IN THE SECOND RECESS
103
ROTATE DRIVE SHAFT TO ROTATE BODY RELATIVE TO COAXIAL CABLE TO STRIP OUTER JACKET TO EXPOSE PORTION OF OUTER CONDUCTOR USING FIRST BLADE, AND TO STRIP OUTER CONDUCTOR AND DIELECTRIC LAYER TO EXPOSE PORTION OF INNER CONDUCTOR USING SECOND BLADE
104
REMOVE CUTTING HEAD FROM SECOND RECESS
105
POSITION CUTTING HEAD ON COAXIAL CABLE AND ROTATE DRIVE SHAFT SO THAT CUTTING HEAD REMOVES DIELECTRIC LAYER BETWEEN INNER CONDUCTOR AND EXPOSED PORTION OF OUTER CONDUCTOR (AND OPTIONALLY FLARES OUTER CONDUCTOR)
106
FINISH

FIG. 10

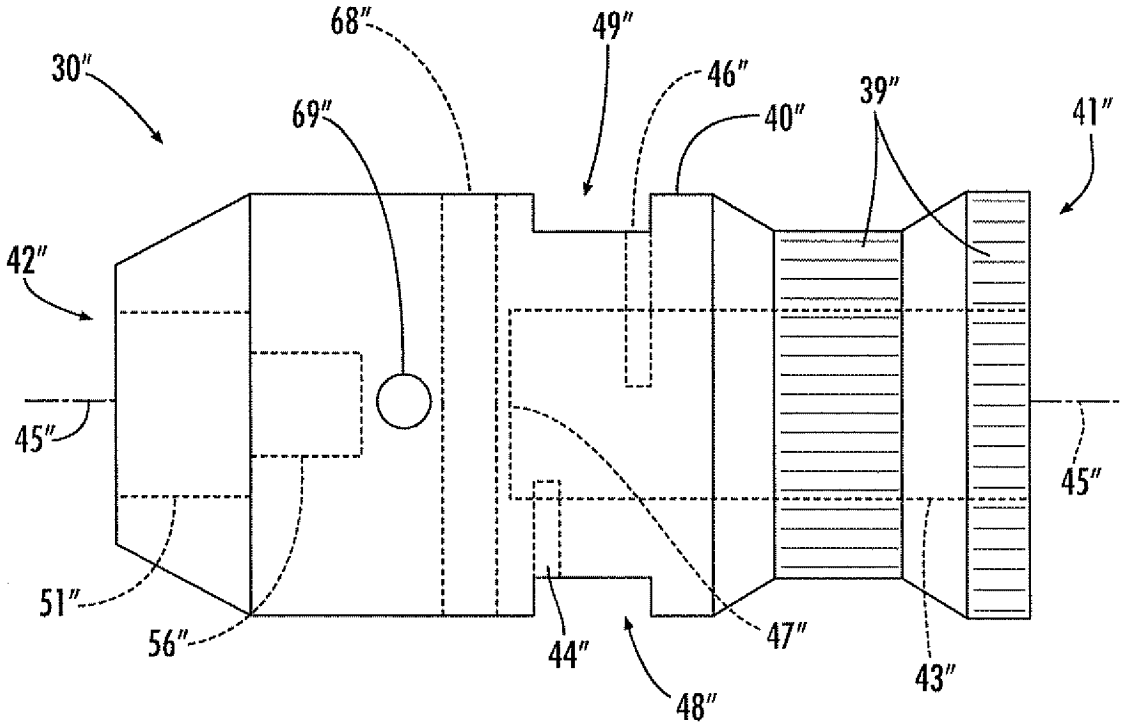


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/056896

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02G1/12 H01R43/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02G H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 271 730 A2 (RADIO FREQUENCY SYSTEMS INC [US]) 2 January 2003 (2003-01-02) paragraph [0007] - paragraph [0013]; figures 1,2,5,6 abstract	1-21
A	US 6 242 699 B1 (GREINER MARTIN [DE] ET AL) 5 June 2001 (2001-06-05) the whole document	1-21
A	US 4 317 279 A (SMITH ROBERT R ET AL) 2 March 1982 (1982-03-02) abstract column 2, line 35 - column 4, line 42; figure 1	1-21

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 December 2009	23/12/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Warneck, Nicolas

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/056896

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 690 324 B1 (COMMSCOPE INC [US]) 2 January 2008 (2008-01-02) abstract paragraph [0020] - paragraph [0023]; figure 3 -----	1-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/056896

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1271730 A2	02-01-2003	BR 0202202 A	01-04-2003
		CN 1393966 A	29-01-2003
		US 2002194728 A1	26-12-2002
US 6242699 B1	05-06-2001	AU 2062600 A	21-09-2000
		BR 0001333 A	17-10-2000
		DE 19911903 A1	21-09-2000
		EP 1037349 A2	20-09-2000
US 4317279 A	02-03-1982	NONE	
EP 1690324 B1	02-01-2008	AT 382943 T	15-01-2008
		AU 2004310980 A1	16-06-2005
		CN 1926645 A	07-03-2007
		DE 602004011100 T2	18-12-2008
		DK 1690324 T3	28-04-2008
		EP 1690324 A2	16-08-2006
		WO 2005055385 A2	16-06-2005