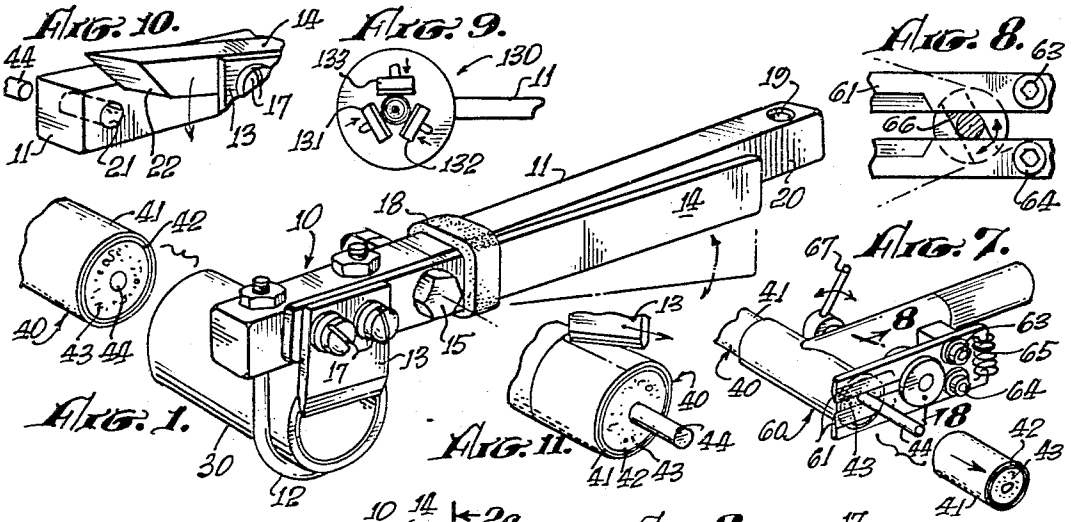
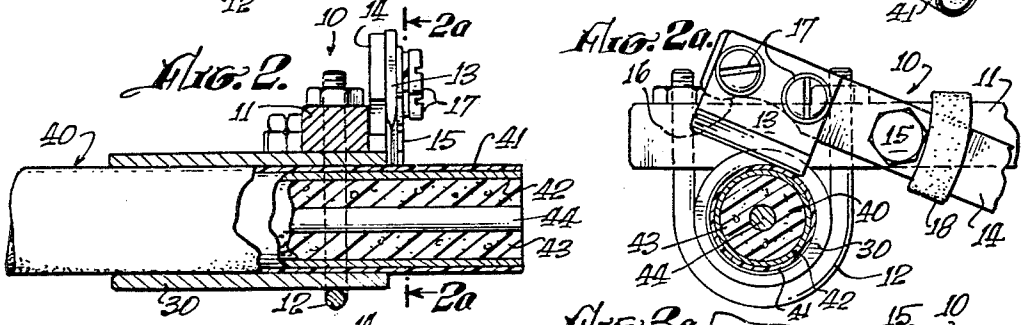
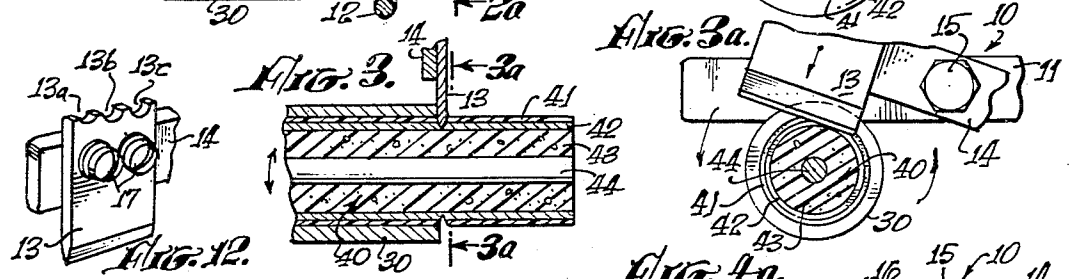
Dec. 30, 1969 G. N. CIMOLINO 3,486,216

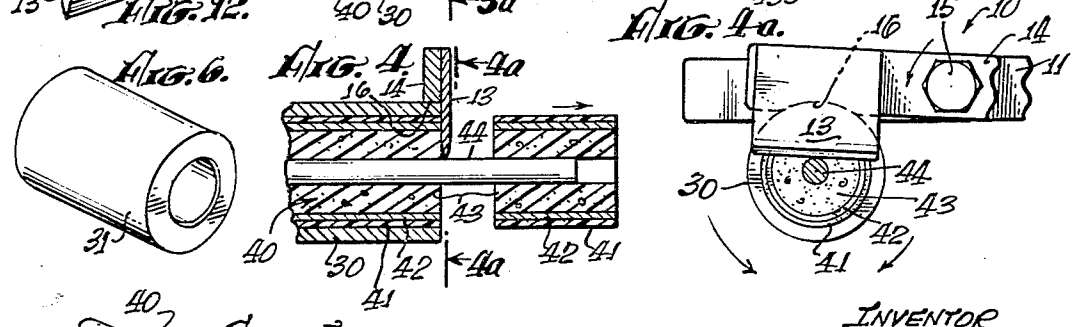
CO-AXIAL CABLE STRIPPING, TRIMMING AND CUTTING TOOL

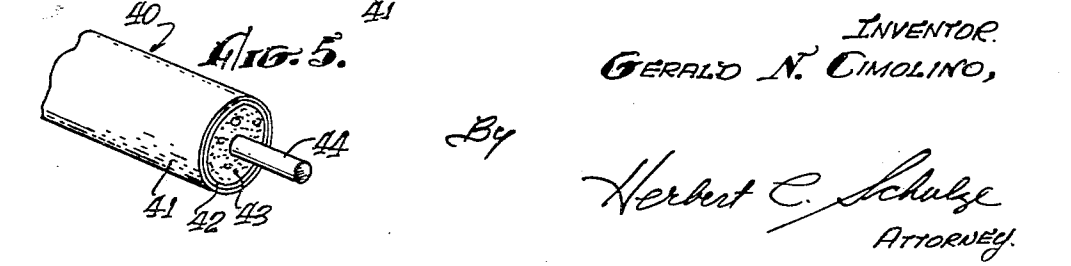
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CO-AXIAL CABLE STRIPPING, TRIMMING AND CUTTING TOOL

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ABSTRACT OF THE DISCLOSURE

This invention is a tool which strips co-axial cable and has a sleeve giving the proper measurement for length of cable end for proper connection. The knife arrangement is adapted in a cooperative manner to cut the outer shielding, to cut and score the aluminum tubing normally used as a shield and outer connector, and, after breaking of the aluminum tubing by means of the tool handle and guide, cutting the insulation for complete removal along the center conductor.

The tool comprises a sleeve with a handle and knife with means to cut each of the various elements in the proper manner, with appropriate stop positions to avoid damaging the center conductor, and with means to break the aluminum cable tubing after scoring and without crushing or deforming the aluminum tubing.

The tool further has adequate means for allowing the stripping of the outer vinyl, or other shielding, to provide for ground connection, or other connection, to the aluminum tubing. Other features of the tool include a handle arrangement which can be used to straighten previously damaged cable, means to cut off the center conductor means to scrape insulation from the center conductor and other features to provide a complete co-axial cable tool.

BACKGROUND OF THE INVENTION

Field of the invention

This invention is in the field of devices for removing concentric insulation, and the like, and particularly in the field of removing concentric insulation and of severing, without deformation, of a concentric conductor around a cable conductor, particularly in the field of co-axial cables.

Description of the prior art

There is no known prior art which can be considered in relation to this invention. It is the custom in the trade, up to this time, to utilize cutting pliers, cable cutters, pocket knives, and similar tools for cutting and stripping insulation, and the like, from co-axial cable.

In such methods as are used, there is inaccuracy as to the exact length of insulation and the like stripped, and the aluminum shielding is frequently damaged, or bent, in such manner that the electrical conducting qualities are altered. Another disadvantage of the use of tools as presently customarily used, is that the center conductor is frequently scratched, burred, or otherwise damaged by such tools as pocket knives, and the like. This, again, alters the qualities and is most undesirable.

SUMMARY

As heretofore mentioned, in the past it has been the custom to attempt to strip insulation and to cut the aluminum or other shielding on co-axial cables by various, relatively crude, means and by adaptation of existing tools, not particularly designed, nor adequate, for the specialized nature and requirements of co-axial cable.

Co-axial cable is used in connection with cable television and similar uses. Normally, it consists of a single center conductor (for example, copper wire) surrounded by an insulating material of plastic foam, or the like. The plastic foam, or other material, is enclosed in a very close and accurate relationship within an aluminum shield, which is essentially aluminum tubing, braided or woven metal shielding, or the like. In some cases, there is no insulation outside of this aluminum shield or ground conductor; in other cases, there is further insulation.

The foam insulation serves as insulation and also to accurately maintain the distance of the center conductor from the shielding or ground conductor. The aluminum tubing, or the like, can, it is understood, serve the various functions independently or at the same time of appropriate shielding of the center conductor together with a ground or other connector when desired. Two conductors are required for certain signals, as is well known art, and in this case the aluminum or other shielding is also a conductor. The interchangeable names which may be used herein apply in whatever connection the material is being used. Normally, it is important that the ground conductor or shield be maintained at a given relationship to the center conductor, and this invention provides for the same. In this manner, continuity and accuracy of signal transmission, whether a single or multiple signal, may be maintained.

Some co-axial cables do not have an outer shielding over the ground conductor or shielding. The outer shielding is normally of a vinyl, or similar plastic material, but may be any material to aid in protecting the cable against corrosion and physical damage. This outer vinyl shielding, or the like, also provides insulation as required around the ground connecter or metal shielding, as heretofore described.

In making connections to co-axial cable, a length of center wire must be completely exposed from its insulation, the surrounding aluminum tube or other ground connector or shielding, and any additional insulation.

In order to maintain the proper electrical qualities of this co-axial cable, it is essential that the aluminum tubing, or the like, not be damaged (for example, by being smashed, or having its edges flared as will result from a tubing cutter, or the like, or having any other alteration which affects its uniform distribution about the center cable at a given distance).

In addition, it is desired to make a uniform and clean cut through the outer insulation when provided, and through the inner insulation; it is essential in making such cuts that the center cable, or copper wire, be undamaged. With the ordinary use of a pocket knife, or the like, it sometimes occurs that the knife penetrates too deeply and damages the cable. Also, such use of knives and other normal cutting tools for this purpose generally results in a ragged and uneven edge.

The use of pipe cutters, or the like, to cut the aluminum tubing has proven most ineffective since such items either bend the tubing, or cause the end to be somewhat flanged, creating a differential in the predetermined electrical quality of the co-axial cable.

I have invented a self-contained tool which, with a single blade, and in cooperation with its other elements, accomplishes all of the desired results. A cooperative combination of handle, blade, and other elements provide a uniform and proper length to the end of the cable exposed, and provide a uniform and concentric cut for each of the different elements of insulation or shielding.

By use of this invention, the vinyl, or other outer shielding or insulation, is cut uniformly and at the proper depth; the aluminum ground conductor or shielding is then scored, but not completely cut, with the knife after which another part of the tool serves to break the ground

conductor so that a clean finish results without any bent or flanged edges. Further, the tool is so adapted that a complete and proper cutting of the foam insulation is accomplished, and means are provided so that the center conductor cannot be damaged, yet that the foam can be cleanly and completely removed from the center conductor.

It is an object of this invention to provide a tool for cutting and stripping the insulation and other elements on co-axial cable.

It is a further object of this invention to provide a tool for cutting and stripping the insulation and all other elements relating to co-axial cable in which the aluminum ground conductor or shielding may be broken clean without damage.

It is a further object of this invention to provide a tool, as heretofore described, which can accomplish all of the cutting, stripping, and severing of the various elements of co-axial cable with essentially one setting and one operation.

It is a further object of this invention to provide a tool for the purposes heretofore described, which has means to insure against damaging the properties of the co-axial cable.

The foregoing, and other objects and advantages, will be clear to those skilled in the art, upon reading the complete description of the preferred embodiments, together with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective of a preferred embodiment of this invention;

FIGURE 2 is a partial section on the axis of item **30** as shown in FIGURE 1 with the co-axial cable in position in the tool;

FIGURE 3 is a partial section of a portion of the item shown in FIGURE 2 with certain elements removed;

FIGURE 4 is the view of the FIGURE 3 at a progressive position during operation;

FIGURE 2*a* is a partial section on **2***a*—**2***a* of FIGURE 2;

FIGURE 3*a* is a partial section on **3***a*—**3***a* of FIGURE 3;

FIGURE 4*a* is a partial section on **4***a*—**4***a* of FIGURE 4;

FIGURE 5 is a perspective of the end of a co-axial cable after having been worked by the item shown in FIGURE 1;

FIGURE 6 is a perspective of a size reducing sleeve to be inserted in item **30** shown in FIGURE 1;

FIGURE 7 is a partial perspective of an alternate embodiment of this invention;

FIGURE 8 is a view on **8**—**8** of FIGURE 7;

FIGURE 9 is a front elevation of a chuck arrangement to replace element **30** in FIGURE 1;

FIGURE 10 is a partial perspective of the end of elements **11** and **14** of FIGURE 1 showing a modification;

FIGURE 11 is a partial perspective of a piece of co-axial cable showing a special operation with the element **13** of FIGURE 1; and

FIGURE 12 is a perspective of element **13** of FIGURE 1 showing a modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment is shown generally by the numeral **10**, and particularly in FIGURE 1. There is indicated in FIGURE 1, also, the end of a piece of co-axial cable indicated generally by the numeral **40**. The co-axial cable is seen to consist of the center conductor **44**, the foam insulation **43**, the aluminum ground connector or shield **42**, and the vinyl or other protective outer shielding **41**.

Examination of FIGURE 1 will show that this invention comprises a handle **11** of rigid material, such as square, round or other suitable shaped steel bar, or the like. The handle **11** has attached to it by suitable means such as "U" bolt **12**, or the like, a short length of rigid tubing **30**. The tubing **30** has an inner diameter such that it fits slidably, but in relatively snug connection, with the outer surface of the co-axial cable **40**. Various tubing inserts, such as **31**, may be used in lieu of **30**, or as bushings within **30**. The use of inserts or different sized guides accommodates for different size cable and for cables without the outer insulating shield, and this allows universal use of one tool.

The tubing **30** is of suitable length such that it may be used as a guide marker for determining the proper length to be trimmed for the normal connection. It is also possible to provide holes through the wall thickness of tubing **30** for the purpose of gauging the length of cable being worked upon, or other suitable means may be employed for marking the appropriate length.

A blade actuating lever **14** is pivotally mounted to handle **11** by suitable bolt **15**, or the like. A blade **13** is suitably fastened to blade actuating lever **14** by screws **17**, or the like. The blade may be preferably of double beveled knife stock. By utilizing such material, exceptional wear and cutting qualities for this purpose may be imparted to the device. Also, the advantage is had that the blade is reversible for added use. This will be apparent particularly in observing FIGURES 2*a* and 3*a*, wherein it is noted that one portion of the blade will normally receive the most use, but when reversed, the other portion will also receive equal use.

A suitable means, such as a rubber band **18**, or the like, is provided to hold the blade in the normally closed position as shown in FIGURE 1. This is important so that the blade will not be operating loosely when the tool is being carried, which could result in damage or injury.

A hole **19** is provided through the handle as indicated so that it may be carried on a clip, or the like.

Modifications for the particular embodiment shown in FIGURE 1 are illustrated particularly in FIGURES 9, 10 and 12. FIGURE 9 illustrates a view of the guide element **30** which has been renumbered for these purposes as **130**. This modification incorporates a three jaw chuck, the jaws of the chuck being illustrated by the numerals **131, 132** and **133**. Such a chuck could be spring loaded or individually adjusted to accommodate any size cable without the necessity of inserts as has heretofore been described and as illustrated in FIGURE 6.

FIGURE 10 illustrates an alternate embodiment wherein a hole **21** is drilled through the end of handle **11** at a suitable position, and blade actuating lever **14** has been altered so as to provide a cutting edge **22**. With this modification, the center conductor **44** may be cut with this tool, if desired, by inserting it through the hole **21** and actuating the lever **14** so as to cause the cutting edge **22** to cut off any amount of the cable extending through hole **21**, by a shearing action.

FIGURE 12 illustrates a further modification, which is a modification to the blade **13**. In this case, the blade **13** has a series of rounded notches **13***a*, **13***b* and **13***c* at its upper, or dull, side. These notches are of the correct diameter of various sizes of center conductor cable. They may then be used to scrape the center conductor if it is desired to have a particularly clean center conductor, or for the purpose of removing any portions of the foam insulation **43** which may adhere to the center conductor.

FIGURES 7 and 8 illustrate an alternate embodiment in which double cutting blades are used. This embodiment comprises handle means (unnumbered) attached to the cable guide **60**, similar to item **30** shown in FIGURE 1. A pair of blades **61** independently pivotally mounted at **63** and **64** and spring actuated at **65** are utilized in this embodiment in place of the single blade used in the prior illustrated embodiment. A cam action, such as indicated at **66**, actuated by an appropriate lever **67**, opens the blades and closes the blades for proper use. The use of two or more blades means that during the operation, as

will be hereinafter described, the entire cutting may be accomplished by rotating the tool less than a full rotation.

FIGURES 2, 2*a*, 3, 3*a*, 4, 4*a* and 11 illustrate operations utilized with the device shown in FIGURE 1. The cable **40** is first slipped into the guide **30**, and the first cutting operation is as indicated in FIGURES 2 and 2*a*. A slight pressure is exerted by the hand of the operator against the knife, and the knife is rotated completely around the cable **40**. This is accomplished by a complete turning of the tool. After using the tool a few times, the operator will be able to feel when the outer vinyl shielding has been cut.

When the outer vinyl shield has been cut, the operator then continues to apply a slight amount of pressure in order to provide the effect shown in FIGURE 3, wherein the aluminum ground conductor, or shield, is scored, but not cut all the way through. At this position, the entire handle, and particularly guide **30**, is twisted or bent with reference to the axis of the cable. A slight bending at this time causes the aluminum shield **42** to break completely, and it gives a completely clean break without bent or flanged portions.

The next operation encompasses the further application of pressure on the blade and the turning of the tool completely about the cable until the knife has penetrated as far as it can and is stopped from further penetration by the shoulder **16**. This position is a position in which the knife has almost touched, but not quite touched, the center conductor **44**. By twisting the severed portion, the foam insulation is caused to break off clean at its remaining small edge of contact, and it may then be slipped from the center conductor, as indicated particularly in FIGURE 4.

As previously mentioned, at this position, it may be desirable to be using the modification shown in FIGURE 12 and any remaining bits of foam which may have adhered to center conductor **44** can be scraped away.

After completing the cut and leaving the proper amount of center conductor exposed, it is frequently desirable to remove a small portion of the outer vinyl insulating shield **41**. This is accomplished by moving the cable further along in the tool and making another cut around the circumference in the same manner as the first cut was made, but stopping as soon as the vinyl has been severed. The cable is then removed from the tool and the blade is actuated to a relationship of ninety degrees (90°), more or less, with the handle. When in this position, the blade can be used as indicated in FIGURE 11 to slit the vinyl shielding **41** for easy removal of that small additional portion. This now will leave a length of the aluminum ground connector and shield available for adequate electrical connection where desired.

As previously mentioned, if the center conductor is not of the right length, it may be sheared off by using the modification shown in FIGURE 10.

It will be a matter of choice whether the operator of the device wishes to have the cable being cut extending to the right or left of the device. If the cable extends from the side of the blade through the holder **30**, the holder **30** can be used as a very easy and accurate measuring device since the end of the cable may be brought to the end of **30** before starting the cut. Individual operators will from time to time acquire their individual preferences for certain conditions in this regard.

The knife blade **13** requires some slight additional explanation in that it should be pointed out that a single bevel blade may be used, or a double bevel blade, for the reasons outlined heretofore in this application. It is also deemed very desirable to use a double double bevel blade. Such blade is known to those skilled in the knife art, and the angular arrangement of the double double bevel giving a first angle less acute than the second angle, facilitates the proper entry of the blade into various materials and yet allows a greater cutting edge support in which longer service is obtained from the blades.

It is important to observe that the end of this handle has been so constructed and provided at **20** that it is strong and of such a shape that it may be used for a hammer, or tamping device, since frequently the installer of cables will find that the end of the cable has been previously crushed through some type of cable cutting operation or other mishaps. This cable can be relatively easily straightened by using a tapping from the blade of the tool, and then it can be shaped so that the tool, and particularly the tool guide **30**, will accommodate it with ease.

Alternate embodiments have been shown, as well as modifications, for the purpose of showing some of the broad changes which can be incorporated without departing from the invention disclosed. For example, one additional modification would be to supply additional stop positions, other than that shown, so that the length of each stroke for the cutting knife could be limited rather than being dependent upon the hand of the operator completely.

The various alternative embodiments and most particularly, the preferred embodiment indicating the various modifications, particularly will point out the unique method of preparing coaxial cable for connections, which can be accomplished with the use of my invention. It is thought that the method as now provided through the use of this, or a similar tool, is in itself a unique and inventive method and a completely new approach to the preparation of co-axial cable for connection.

While the embodiments of this invention shown and described are fully capable of achieving the objects and advantages desired, it is not my intention to be limited thereby, as such illustrations and described embodiments are for illustrative purposes only. Many modifications will occur to those skilled in the art without departing from the inventive concepts disclosed.

I claim:

1. The method of trimming and stripping co-axial cable comprising placing said cable within a guide; actuating a knife in a rotary motion around the circumference of said cable until the ground conductor or metallic shield is scored but not cut through; bending the end of said cable with reference to the portion of said cable held within said guide to break said metallic shield; actuating said knife toward the center of said cable while imparting a rotary motion thereto; stopping said knife before it touches the center conductor of said cable; and removing the cut portion of the insulation conductor and the like from said center conductor.

2. The method of claim **1**, in which an outer insulating shield about the outer circumference of said ground connector or metallic shielding is cut prior to cutting said metallic shielding by the same knife used in scoring said metallic shielding.

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