United States Patent [19]

Biddle

[11] **3,769,705**

[45] **Nov. 6, 1973**

[54] **WIRE STRIPPING DEVICE**

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[73] Assignee: **Lockheed Aircraft Corporation,** Burbank, Calif.

[22] Filed: **Dec. 20, 1971**

[21] Appl. No.: **210,024**

[52] **U.S. Cl.** **30/90.1**

[51] **Int. Cl.** **B26b 27/00**

[58] **Field of Search** ..... 30/90.1, 91.2; 81/9.5 R, 9.5 C; 82/46

[56] **References Cited**

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Primary Examiner—Othell M. Simpson
Assistant Examiner—J. C. Peters
Attorney—Frank L. Zugelter

[57] **ABSTRACT**

A device for precisely and squarely cutting a length of insulation or shielding about a wire preparatory to stripping it from a cable, comprising a body member having a bore into which the cable is inserted and supported, a cutting element secured to a frame bearingly mated to the body member and which is adapted to communicate with such bore, means for biasing the frame and cutter in a direction for the cutter to engage the insulation about the wire, and a micrometer mounted in fixed spaced relationship to the body and which provides in its calibrated adjustment and operation for varying the exact degree or extent of movement or displacement for the frame and cutter as the cutter slices into the insulated cable. The setting of the micrometer limits the extent of movement of the frame and cutter in relation to the body member and its bore. The biasing means is adjustable to effect the desired tension on the material of the insulation. Scale means is provided to determine the length of the cable to be inserted into the body and by which a length of insulation is determined to be cut. The cutter performs a slicing action across the insulation as the device is turned about the cable and in accordance with the tension provided by the adjustable biasing means, to effect a clean and true or square cutting of a layer of insulation or shielding to an exact depth. Adaptors or bushings are provided for the body for supporting a variety of sizes of insulated cables.

10 Claims, 4 Drawing Figures

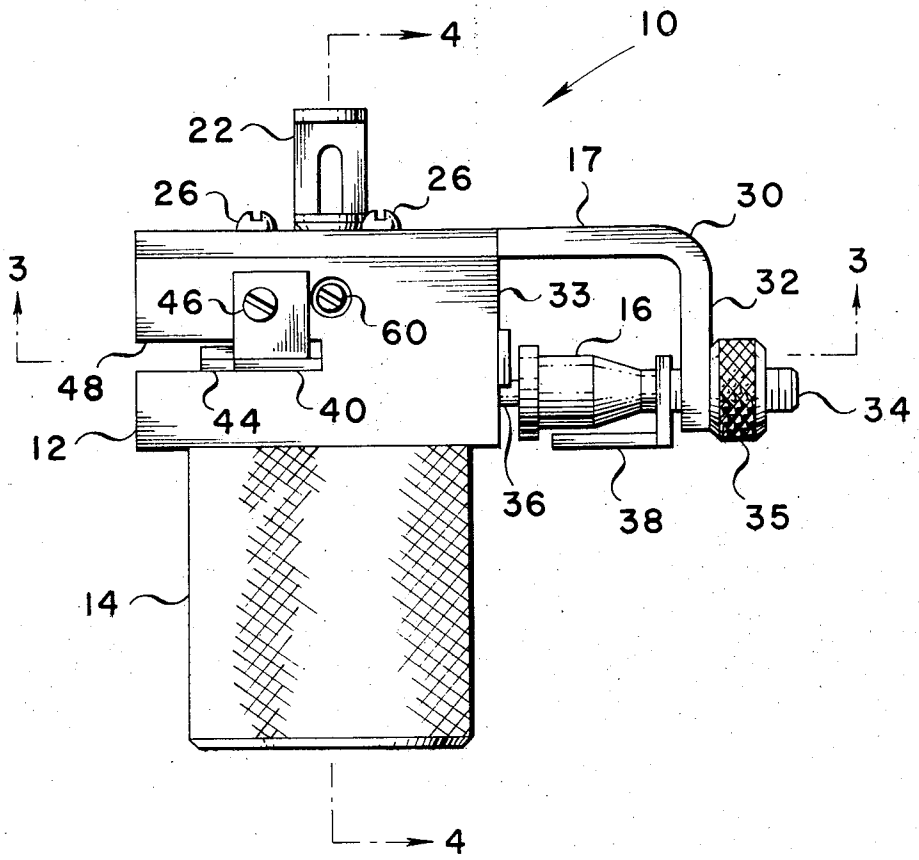
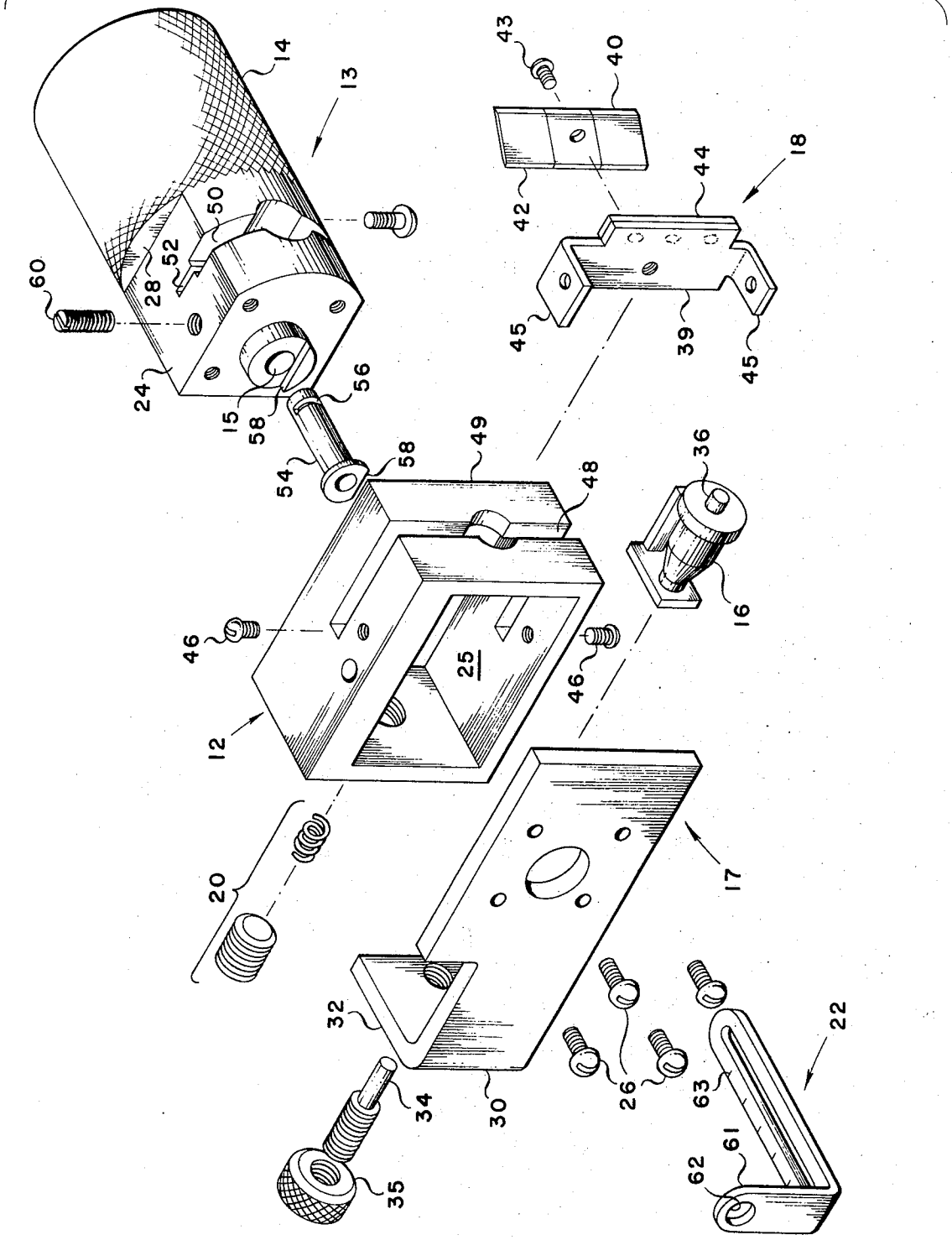


FIG. 1


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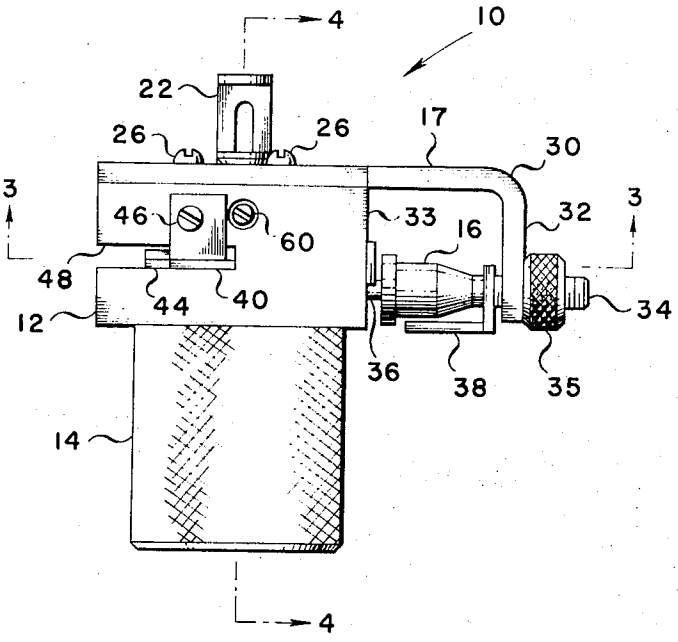


FIG. 2

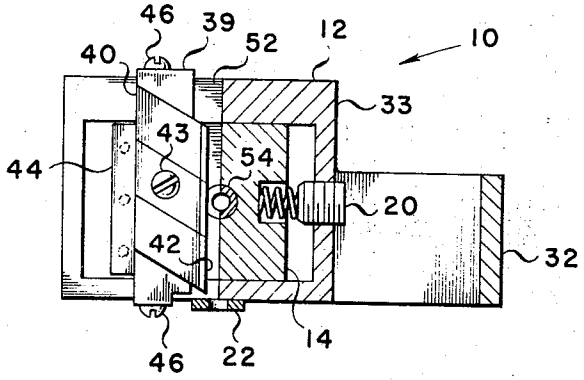


FIG. 3

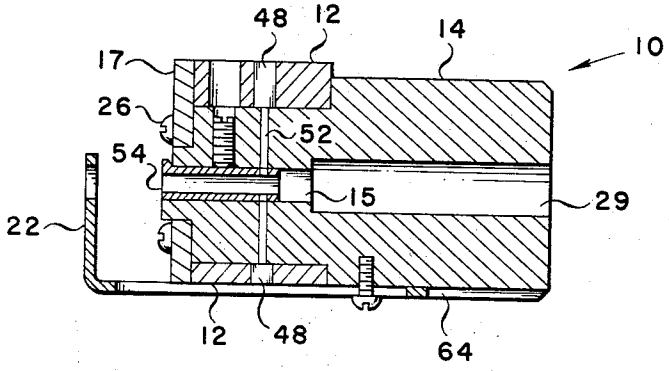


FIG. 4

WIRE STRIPPING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

Conventional practice in stripping insulation from an electrical conductor has included both manual cutting with a knife and other instruments. In the assembling of electrical circuits required in avionic mechanisms utilized in aircraft today, for example, a device for cutting the insulation of a small sized cable must adequately perform the important function of precisely and squarely cutting one or more layers of such insulation or shielding, from either a coaxial cable or other cable, in order to achieve a clean exposure of wire of a given length preparatory to making a precision contact for it with other similar wires in the mechanism being assembled. The space limitations required of these avionic devices require that the least quantity and smallest sizing of electrical cable circuitry be utilized. Also, the assembler must work with cables having short and accurate lengths of exposed wire for a snug positioning in such a mechanism. Thus, a device for precisely and squarely cutting through a layer of insulation or shielding at a given point along the length of a small sized cable would accomplish these objectives. My invention does so.

2. The Prior Art

Examples of prior art wire stripping instruments which have been known prior to this invention are found in the disclosures of the following U.S. letters Pat. Nos. 3,378,924; 3,304,605; 3,169,315; 2,955,494; 2,903,064; 2,871,739; 2,863,158; 2,817,255; 2,752,676; 2,683,930; 2,695,537; 2,721,833; 2,452,734; 2,300,087; 1,763,299; and 1,566,297.

PROBLEMS IN THE PRIOR ART

Wire stripping devices in many instances with respect to small gage cables, coaxial and otherwise, are cumbersome, bulky, expensive, and time-consuming, and cannot be efficiently applied to small gaged cables with a maximum degree of consistency and continued preciseness required in cutting the insulation or shielding from its electrical conductor or wire. Also, tight manufacturing tolerances required on many parts demand a preciseness in cutting and stripping.

SUMMARY OF THE INVENTION

This invention relates to a device for cutting insulation or shielding comprising one or more layers from an electrical cable, coaxial or otherwise, and ordinarily referred to as a wire stripping device, and is particularly directed to a device for cutting one or more of such layers provided on a coaxial cable or the like preparatory to physically stripping such layers cut thereby from the remainder of the cable.

An object of this invention is to provide an efficient and speedy cutting of one or more of such layers on a cable preparatory to stripping it from such wire.

A further object of this invention is to provide for a slicing cutting action upon and to an exact depth in the layer as distinguished from other forms of cutting action, in order to completely eliminate the nicking of the wire which otherwise damages the wire in its electrical installation, and to eliminate frayed or hanging particles of the layer to either side of the plane of cutting.

Another object of this invention is to provide a true or square cutting upon the layer in the operation of the device thereon.

Another object of this invention is to reduce the time consumed in wire stripping which heretofore has been routinely involved in the preparation for stripping one or more such layers from a cable, thereby reducing the total number of manhours to work therefrom and the cost of such work.

Another object of this invention is to provide a precise depth of penetration to any desired extent or degree in the slicing action of the cutting device, such penetration corresponding to the exact radial or thickness dimension of the layer being severed.

Another object of the invention is to provide a precise cutting on a greater variety of sizes of insulated cable than realized previously, with only one device.

A still further object of the invention is to provide an economical and efficient device, one which is compact in nature and size, with minimum number of parts, and easily assembled and operable.

An object of this invention is to provide a cutting of one or more of such layers from a cable, coaxial or otherwise, without nicking or damaging the wire conductor or other layers in the cable.

Another object of this invention is to provide a variable tension on a cutting element applied to the layer, depending upon the nature of the material constituting such layer, be it rubber or fibrous, so that a clean cutting through the layer is achieved, as distinguished from a pushing aside of or obtaining frayed pieces of the layer not being severed in the cutting action. Such a means to vary the tension of the blade on the insulation changes the pressure applied by the blade to the layer material and thus provides an effective technique to cut clearly through such material.

A further object of the invention is to provide a support for the cable's length as a layer is severed, eliminating axial movement of the cable and its insulation or shielding during the cutting operation.

Another object of this invention is to provide a way to eliminate axial movement of the insulated cable during the cutting operation thereon, thereby ensuring a true and square cut to the cut layer.

These and other objects of this invention will become fully apparent from a reading of the following description of the preferred embodiment of the invention, the appended claims thereto, and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded perspective view of the preferred embodiment of the invention.

FIG. 2 is a plan view of the preferred embodiment of the invention in its assembled condition.

FIG. 3 is a view taken on line 3—3 of FIG. 2.

FIG. 4 is a view taken on line 4—4 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing in which reference characters correspond to the following numerals, reference characters **10** (FIGS. 2, 3 and 4) refers generally to a wire stripping device constituting an embodiment of this invention. Device **10** generally comprises a frame **12**, a body **13** longitudinally mated to the frame **12** and having on its other end a handle **14**, a bore **15**

longitudinally included in the body 13 for introduction and support of an insulated cable to be stripped, a micrometer 16 mounted on a base member 17 secured to the body 13 for cooperative action with the frame 12, a cutting means 18 accommodated in openings provided in the frame 12 and the body 13 in such a manner as to communicate with the bore 15 of the body 13, a means 20 for biasing the cutting element to its maximum point or plane of penetration in the bore 15, and a scale means 22 for determining a given length of insulated cable to be inserted and cut of one or more of its layers.

The frame 12 comprises a continuously formed four-sided, metal member having longitudinally disposed open opposing faces into the frontal one of which the body 13 is slip-fitted. The body 13 includes opposing bearing faces 24 each of which physically rectilinearly engages its associated inner wall 25 of the frame 12 upon assembly of body 13 thereto. The frame 12 is maintained in its position on the body 13 by any suitable means, such as by the base member 17 abutting its rearward open face and being secured, as by screws 26, to the end of the body 13 and by one of more shoulders 28 provided on the handle 14. Each shoulder 28 seats in abutting engagement with the frontal wall of frame 12; i.e., along its frontal open face. Thus, while frame 12 and body 13 are longitudinally secured together by their metal bearing surfaces, they are capable of rectilinearly moving in lateral relationship to each other; i.e., in a lateral direction with respect to the longitudinal axis of the bore 15 in the body 13.

The body 13 preferably includes at the terminus of the bore 15 the start of a countersunk bore 29 extending into and through the handle 14, for relieving any tension which might be induced on the length of the layer of insulation or shielding of the cable in the device 10.

The base member 17 conveniently provides a manner for mounting the micrometer 16 in a fixed spaced relation to the body 13. It includes an integrally formed elbow 30 from which an arm 32 is developed in parallel spaced relation to the one side 33 (FIG. 3) of frame 12. The micrometer 16 is suitably mounted to the arm 32 by means of a shaft 34 suitably secured to its one end and threaded in an aperture provided in the arm 32. A nut 35 is provided on the shaft 34, to bear against arm 32 for securing a particular adjusted position for the micrometer 16. Such securement calibrates out the accumulated tolerances existing between a device 10 and another. In other words, it is merely a calibrating device or technique to ensure that each device 10 will cut in exactly the same manner as the next tool.

The other end of the micrometer 16 includes an operable rod 36 cooperatively related to the one side 33 of the frame 12 (FIG. 3). The spring-and-Allen-screw combination 20 mounted in appropriate facing apertures in body 13 and side 33, respectively, biases the frame 12 towards the micrometer 16 and its operating rod 36. Conversely, the abutment of the rod 36 against the frame's side 33 affects the lateral disposition of the frame 12 relative to the body 13. Adjustment of the micrometer 16, therefore, laterally displaces the frame 12 relative to the body 13 in a direction opposite to the direction of the biasing effect of the means 20. This adjustment in turn predetermines the maximum extent, as distinguished from the maximum penetration, of the cutting means 18 into the bore 15. Thus, an accurate positioning of micrometer 16 sets the maximum and an accurate depth to which a cut can be made into an insulated cable, in a given operation of device 10, by limiting the return of the frame 12. The readings on the micrometer 16, of course, may be measured in terms of the readable depth of the cut.

The cutting means 18 comprises a thin, flat metal backing sheet 39 to which a metal blade 40 having a cutting edge 42 is suitably secured, such as by a screw 43 threaded through the blade 40 and through a punched-out, threaded aperture in sheet 39. A stop 44, preferably in the form of a spot-welded bar (FIG. 1), prevents the blade 40 from rotating about sheet 39 during operation of the device 10. The sheet 39 includes integrally formed and bent apertured tab 45 at its opposite ends for providing a convenient way to secure the cutting means 18 to the frame 12, such as by screws 46. A slot-like opening 48 is formed in a side 49, opposite side 33, and through the upper and lower sides of the frame 12, for disposition of the cutting means 18 within the frame 12. The blade 40 is thus conveniently accommodated in the slot-like opening 48 which extends preferably to more than halfway of the width of the frame 12. A slot or opening 50 is provided inn body 13, and corresponds in its location therein with the alignment of the opening 48 in the frame 12 in order that the cutting edge 42 may be disposed in, preferably an extension 52 of narrower width in, slot 50 which extends to the axis of bore 15 in body 13. This slot extension 52 should fit the blade thickness to prevent its deflection in the operation of the device 10. Thus, upon securement of the cutting means 18 to the frame 12, the frame 12 to the body 13 and the biasing means 20 thereto, the cutting edge 42 is disposed at the plane of such axis. Adjustment of the position of the micrometer 16, of course, displaces the edge 42 therefrom in a lateral direction opposite to the direction of the biasing effect of the means 20 and/or the location of the micrometer 16.

The preferred embodiment of the device 10 includes a plurality of bushings 54 any one of which is slip-fitted to the bore 15. Each bushing 54 has a different sized bore to support a corresponding sized cable to-be-stripped. An annular slot 56 is provided in each bushing 54 for alignment with the slot extension 52 in body 13, and mutually cooperating flats 48 (FIG. 1) are provided on flanges respectively included in body 13 and each bushing 54 for ensuring such alignment by preventing rotation of the bushing in the bore 15. A set screw 60 (FIG. 1) insertable through the frame 12 and body 13 prevents axial displacement of each bushing 54 in the bore 15.

The scale means 22 includes a graduated linear unit arrangement preferably in 1/100 inch gradations, provided in parallel alignment to the bore 15 for measuring a length of cable, from its end, which is to be stripped of its layer or layers. A finger 61 with a hole 62 therein in axial alignment with the bore 15 is preferably provided on scale means 22 for marking the cable in regard to measuring its length for cutting purposes. The zero marking 63 is adapted to be positioned at the plane of the outer wall of base member 17 in the initial step of operation of device 10 on a cable and may thereafter be adjustably secured along its length in a suitable manner in a keyway 64 provided in the bottom of handle 14 (FIG. 4).

Assembly of device **10** should be apparent from the above description, however, briefly, the body **13** is introduced into the frame **12** and aligned with the base member **17** so that the screw **26** project through the member **17** and are secured to body **13.** The cutting means **18** is first assembled and then inserted in the slot-like opening **48** and secured in position to the frame **12** by the use of the tabs **45.** The biasing means **20** may then be assembled to the frame **12** and the body **13,** as shown in FIG. **3,** and this, of course, should bias the cutting edge **42** to its greatest point of penetration in the bore **15.** The micrometer **16** together with its adjusting screw-and-nut **34, 35** are mounted to the arm **32** so that the operating rod **36** is adapted to physically abut side **33.** The scale means **22** is readily mounted to its keyway **64** in the handle **14.** Any one of a number of varied-sized bushings **54,** for a cable of a desired outer diameter (O.D.), is inserted into bore **15** and secured therein by the set screw **60,** however, in order to insert a bushing **54** without interference from cutter **40,** which projects into the bore **15,** side **33** may be manually thumbed and pushed away from arm **32;** i.e., causing side **33** to move closer to body **13.** As this is done, cutter **40,** secured to frame **12,** is removed or retracted from the bore **15** of body **13.**

The micrometer **16** is of the type made and sold by the Brown and Sharpe Mfg. Company, Centredale, R.I., under its Model No. 599—263, and is readily available in the marketplace. The blade **40** is preferably an Exacto type of blade commercially available. Such a blade is sold in the form of a strip, a suitable number from which is readily removed from its scored lines forming a demarcation for each Exacto blade, and which is to be utilized as a blade **40** in device **10.** A double honed edge is preferred, as a single honed edge may possibly start a threading action on and about the layer.

In operation, device **10** is first calibrated by adjustment of nut **35** on shaft **34.** A given sized bushing **54,** corresponding to a given sized cable having, say, three layers of insulation each of which is to be stripped from the wire at a different length from its end, is inserted in and secured to the bore **15** by the screw **60.** The blade **40** has been removed from the bore **15,** as described above, in order to introduce the bushing **54.**

The micrometer **16** is set to a desired reading corresponding to the maximum extent of introduction desired for the knife edge **42** in the bore **15.** The scale means **22** is adjusted to its fully extended position whereby its zero marking **63** is located at the outer wall of the base member **17.** Thereafter, the insulated cable is inserted through the hole **62** provided on the scale means **22** and into the bore of the bushing **54,** the end of it abutting the blade **40** in the bore **15.** The cable is now marked at the hole **62,** after which the scale means **22** is readjusted inwardly, say, for example, a distance of 0.25 inch, which is equivalent to the length of the first or innermost alyer of insulation to be cut from the cable's end. The side **33** of the frame **12** is then thumbed in a lateral direction away from the micrometer **16,** i.e., against the biasing effect of means **20** and toward the body **13,** so that the bore of bushing **54** is free from the blade **40.** The cable is now further introduced into the bore **15** until the marking placed on it is once again in alignment with the hole **62** on the scale means **22.** This step ensures that a 0.25 inch length of insulation will be cut by the operation of the device **10.**

To continue, the side **33** is now released of the grasp of the operator so that the biasing effect of means **20** causes the blade **40** to now engage the outermost layer of insulation of the cable. It is to be noted that the side **33** of the frame **12** and the operating rod **36** of the micrometer are not in physical abutment with each other. The operator now grasps the insulated cable behind the scale means **22** and with the handle **14,** he rotates the device **10** about such insulated cable. This produces a slicing action by the blade **40** and its cutting edge **42** against and into all three layers of insulation. After a few turns of device **10** about the cable, blade **40** has moved into the bore of the bushing **54** to its maximum displacement, as a result of the biasing effect of the means **20** and the stop for the side **33** of the frame **12** provided by the operating rod **36.** Such maximum displacement has already been determined by the setting of micrometer **16.** Further turning of device **10** relative to the insulated cable produces no further cutting or slicing action which would cause nicking or damage to the wire itself. A true (or square) movement for the blade **40** has been provided and which precisely corresponds to the thickness or depth of all three layers of the insulation.

In order to cut a second or middle layer of insulation or shielding, the micrometer **16** is reset to a new measurement indicative of the next maximum extent to which the blade **40** is to be introduced into the bore **15** and which corresponds to the thickness or depth of the second layer of insulation. The scale means **22** is again adjusted inwardly, say, for example, another 0.25 inch distance. Thereafter, side **33** is thumbed toward body **13,** thereby withdrawing the blade **40** from the bore of bushing **54,** so that the operator may further insert the insulated cable. The extent of such further insertion is again readily measured by realigning the marking on the cable with the hole **62,** and, of course, the length of such further insertion is, in this example, a distance of 0.25 inch. Thereafter, the side **33** is released by the operator so that the biasing effect of means **20** again causes the blade **40** to engage the first layer of insulation. The operator again manipulates the device **10** relative to the cable held in hand behind the scale means **22,** in the same fashion as previously described, in order to produce the desired slicing action of the blade edge **42** on the second layer of insulation, to the maximum extent of displacement for the blade **40** corresponding to the micrometer setting. Thus, the innermost and second layers are cut through, at different points along the length of the cable, but not the outermost layer. In order to remove the third or outermost layer, the above procedure is again carried out, with the insulated cable having been inserted into the bore of bushing **54** to the extent desired and provided by the inwardly readjustment of the scale means **22.** After all the layers have been cut through, the cable is removed from the device **10,** and stripping in a conventional or known manner of all such layers at their respective lengths from the end of the cable. The result is a square or true and precise stripping at the desired points along the cable.

The spring in the biasing combination **20** provides for a slot, even sliding action into the layer, with no effective bite (and thus, no distortion of layer material that might cause material fraying or hanging) into the layer material. The Allen screw in the biasing combination **20,** adjustable in nature in the side **33** of the frame **12,**

provides for an effective pressure on the layer material, and may be adjusted accordingly depending upon what kind of layer material is involved in a given situation.

With device **10**, and use of the adaptors or bushings **54**, stripping depth in as little as 0.0014 inch steps from 0.0 inch to cut-off depth on a 3/16 inch O.D. cable should be effectively achieved.

Pursuant to the requirements of the patent statutes, the principle of this invention has been explained and exemplified in a manner so that it can be readily practiced by those skilled in the art to which it pertains, or with which it is most nearly connected, such exemplification including what is presently considered to represent the best embodiment of the invention. However, it should be clearly understood that the above description and illustrations are not intended to unduly limit the scope of the appended claims, but that therefrom the invention may be practiced otherwise than as specifically described and exemplified herein, by those skilled in the art, and having the benefit of this disclosure.

Therefore, what I claim as patentably novel is:

1. A device for cutting one or more layers of insulation or the like from a cable comprising,

a frame,

a body mounted to said frame and including a bore for supporting the cable,

said frame and body being rectilinearly slidable relative to each other,

means defining openings in said frame and body and oriented perpendicular to and in communication with said bore,

a cutting means secured to said frame and mounted in said openings and including a cutting edge in communication with said bore,

means mounted between said body and frame for biasing said frame in a direction causing said cutting means to seek its maximum point of penetration in said bore,

means mounted in fixed spaced relation to said body for limiting the maximum extent of movement in such direction for said frame and cutting means,

whereby upon rectilinear displacement of said frame and cutting means away from said limiting means and against the direction of the biasing of said frame, the cable is insertable into said bore, and upon the return rectilinear movement of said frame in such direction, said cutting edge engages the cable's layer, after which the relative turning between said device and cable causes a slicing action of said cutting edge through the cable to a depth predetermined by the relative position of said lighting means to said frame.

2. The device of claim **1** in which said limiting means comprises a micrometer, the abutment of said frame against said micrometer corresponding to the maximum extent of movement of said frame in such direction.

3. The device of claim **1** including scale means for determining the point along the length of the cable at which the cut is to be made.

4. The device of claim **3** in which said scale means comprises a graduated scale bar adjustable longitudinally of said device, and having means thereon for marking a cable, the marking of such cable and said marking means providing a measurement of a length of the cable to be cut.

5. The device of claim **1** in which said biasing means comprises a spring mounted between said body and frame.

6. The device of claim **5** in which said biasing means is adjustable for regulating the tension of said cutting means on an inserted cable.

7. The device of claim **1** including a bushing for said bore whereby a different sized cable for the device than one sized to the bore is insertable and cuttable by operation of said device.

8. The device of claim **7** in which said bushing includes a flat, and a second flat is included on said body, both flats mutually cooperating with each other for ensuring alignment of said openings by preventing rotation of said bushing.

9. The device of claim **1** including a base member secured to said body,

said frame being disposed between said base member and handle,

an arm mounted on said base member is spaced relation to one side of said frame,

said limiting means being fixed to said arm and being cooperatively related to said side of said frame whereby such limiting movement is effected.

10. A wire stripping device comprising in combination,

a body having a bore for supporting a cable having at least one layer of insulation or the like thereon,

a slot in said body and oriented perpendicular to the axis of and in communication with said bore,

a frame mounted to said body and having an opening therein in alignment with said slot,

said frame and body being rectilinearly slidable relative to each other,

a cutting means including a cutting edge mounted in said opening and secured to said frame, said cutting edge communicable with said bore through said slot,

means for biasing said frame in a rectilinear manner relative to said body so as to cause said cutting edge to seek its maximum point of penetration in said bore, and

micrometer means mounted in fixed spaced relation to said body and being cooperatively related to said frame for overcoming the directional effect of said rectilinearly-acting biasing means,

whereby adjustment of said micrometer means predetermines the maximum extent of said cutting edge in said bore, and upon insertion of a cable in said bore and operation of said device, said cutting edge severs the insulation or the like thereon to such maximum extent.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,769,705 Dated Nov. 6, 1973

Inventor(s) JAMES A. BIDDLE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, line 52, "lighting" should read ---limiting----.

Column 8, line 27, "is" should read ---in----.

Signed and sealed this 23rd day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
★ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334