Nov. 16, 1971 R. G. HORROCKS 3,620,104

TOOL FOR REMOVING COVERING MATERIAL FROM AN ELECTRICALLY CONDUCTIVE CABLE

Filed Nov. 19, 1969 2 Sheets-Sheet 1

Fig. 4

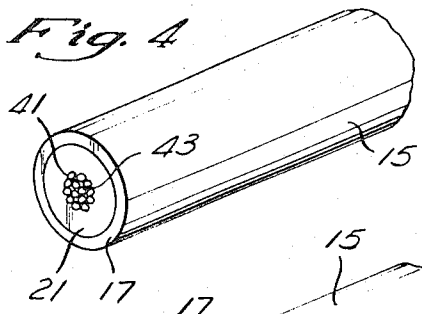


Fig. 5

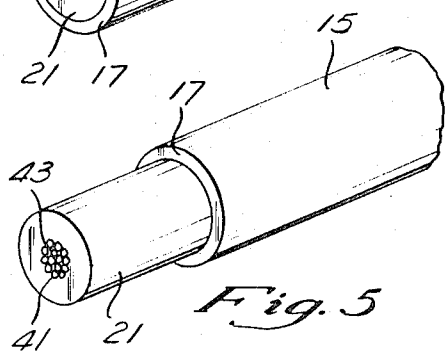


Fig. 1

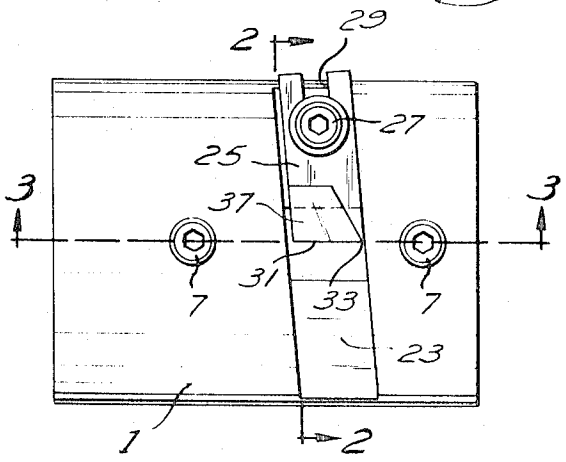


Fig. 2

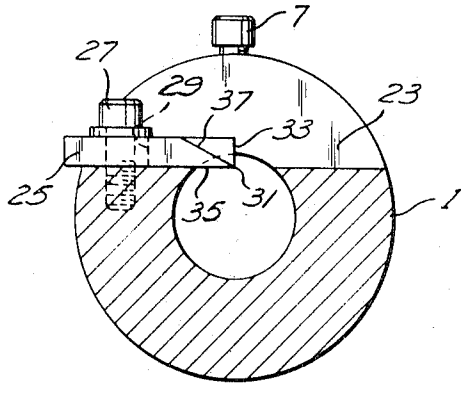


Fig. 3

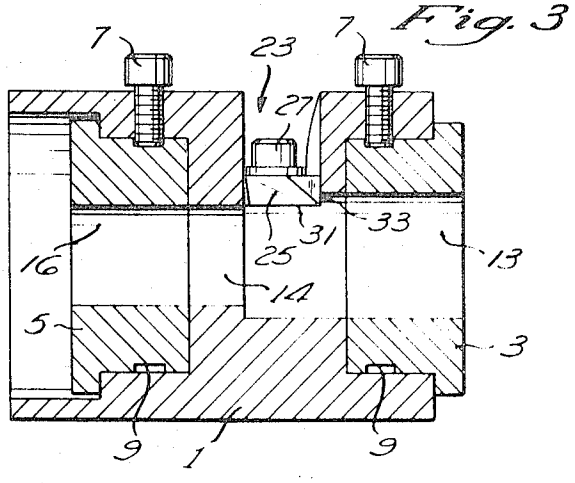


Fig. 6

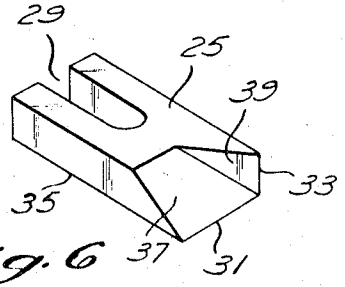


Fig. 7

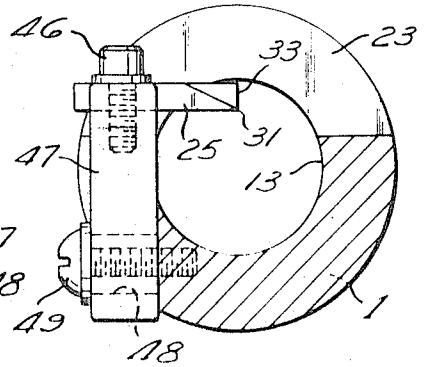
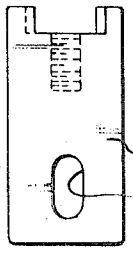


Fig. 8



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Fig. 9

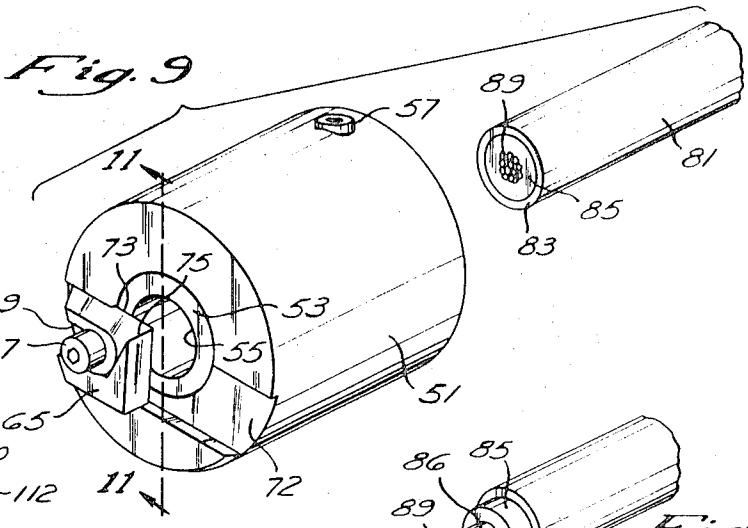


Fig. 15

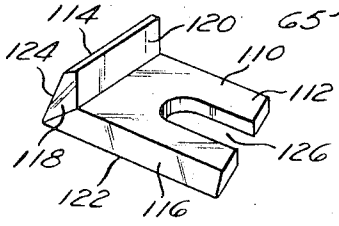


Fig. 12

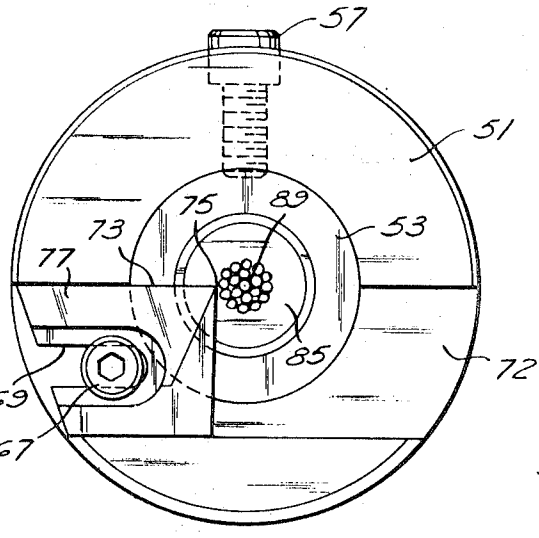


Fig. 10

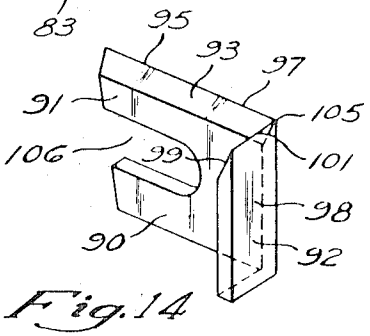


Fig. 14

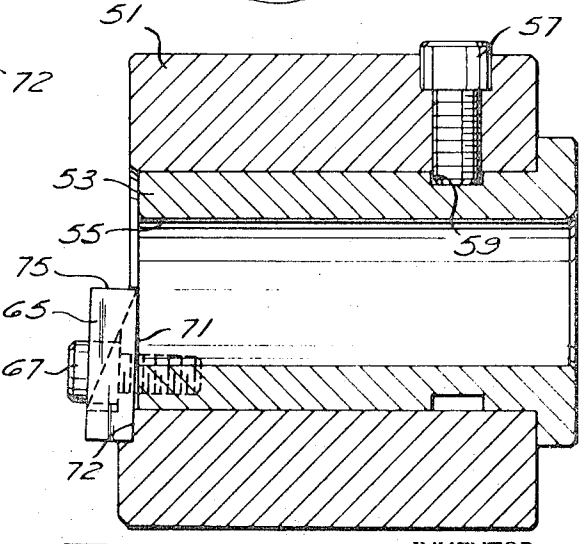


Fig. 11

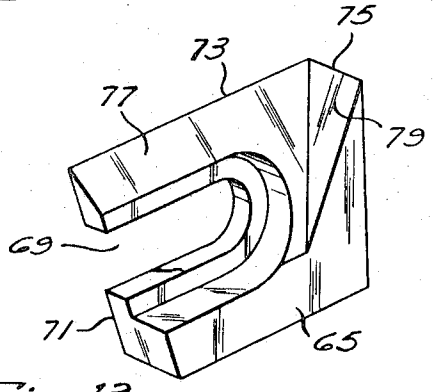


Fig. 13

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3,620,104

TOOL FOR REMOVING COVERING MATERIAL FROM AN ELECTRICALLY CONDUCTIVE CABLE

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Continuation-in-part of application Ser. No. 846,196, July 30, 1969. This application Nov. 19, 1969, Ser. No. 870,022

Int. Cl. H02g 1/12

U.S. Cl. 81—9.5 C 10 Claims

ABSTRACT OF THE DISCLOSURE

A hand tool for removing insulation and/or semiconductive material from an electrically conductive cable. The tool includes a cylindrical body through which a cable may be moved endwise and a blade fixed to the body and having two cutting edges positioned in planes parallel to and transverse to the centerline of the cable respectively.

This application is a continuation-in-part of my copending application Ser. No. 846,196, filed July 30, 1969, and now abandoned.

BACKGROUND

The prior art which is most nearly pertinent to this invention and known to me are my Pat. No. 3,377,891 and my application Ser. No. 710,012 filed Mar. 4, 1968, and now Pat. No. 3,548,690, and Matthews Pat. No. 3,398,610.

The tools of my Pat. No. 3,377,891 and my application Ser. No. 710,012 are suitable for removing cable covering material so as to form a square end surface on such material. However, neither of these tools is entirely satisfactory with cables in which the conductor is not symmetrically mounted within the covering material. It is imperative that the cutting blade should not engage and nick the conductor and, accordingly, it has been necessary to position the cutting edge of the blade just out of contact with the conductor where the covering material is thinnest. However, when so positioned the blade does not sever all the covering material where it is thicker with the result that the spiral chip which is formed is not fully severed and may foul the tool.

The tool of Matthews Pat. No. 3,398,610 was aimed at a solution of this problem but comprises a number of unnecessary parts and includes means for mounting the cutting blade which permits the blade to vary its position in use.

The present invention insures the complete severing of the chip regardless of the variations in thickness of the covering material in offset positioning of the conductor therein when forming a square end cut and includes a minimum number of parts and means for fixedly securing the blade to the tool against any variation of position in use.

SUMMARY OF THE INVENTION

A tool embodying this invention includes an elongated cylindrical body having a passage or a bore of such a diameter as to have a close sliding fit with the surface of a cable from which covering material is to be removed. A blade is securely fixed in position on the body and against variation in position in use. The blade has two cutting edges of unequal length and with a common end, disposed at a wide included angle, for example, an angle of between about 70° and about 90° to one another, the first edge being positioned in a plane transverse to the centerline of the bore and the second edge being positioned in a plane substantially parallel to the centerline of the bore.

By suitably positioning the first cutting edge of the blade relative to the cable, one or more layers of the covering material may be removed from the conductor. The outer semiconducting material, that material and the insulation, and that material, the insulation and the inner semi-conducting material may be removed when the blade is positioned with the first cutting edge substantially tangent to the outer circumference of the insulation, or of the inner semi-conducting material or of the conductor, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a tool embodying the present invention for removing the outer layer of semiconductive material from an electrically conductive cable;

FIG. 2 is a transverse, sectional view, taken on line 2—2 of FIG. 1;

FIG. 3 is a longitudinal, sectional view, taken on line 3—3 of FIG. 1;

FIGS. 4 and 5 are, respectively, perspective views of a cable preliminary to, and after, removal of the outer layer of semi-conductive material therefrom by the tool of FIGS. 1 to 3;

FIG. 6 is a perspective view of the blade attached to the tool as shown in FIGS. 1 to 3;

FIG. 7 is a sectional view similar to FIG. 2 but showing an adjustable carrier for the cutting blade;

FIG. 8 is a side elevational view of the blade carrier of FIG. 7;

FIG. 9 is a perspective view of another tool embodying the present invention and adapted to remove one, two or three layers of material covering the conductor of an electrical cable;

FIG. 10 is an end view of the tool of FIG. 9;

FIG. 11 is a longitudinal, sectional view of the tool of FIG. 9 taken on line 11—11 of FIG. 9;

FIG. 12 is a perspective view of the cable of FIG. 9 from which insulation and the outer and inner layers of semi-conductive material have been removed by the tool of FIG. 9;

FIG. 13 is a perspective view of the cutting blade of FIGS. 9 to 11;

FIG. 14 is a perspective view of a modified form of cutting blade embodying the present invention; and

FIG. 15 is a view similar to FIGS. 13 and 14 but showing another modified form of cutting blade.

The tool shown in FIGS. 1 to 6 is particularly adapted for removing the outer layer of semi-conductive material from insulation surrounding the conductor of an electrically conductive cable. In these figures, **1** designates an elongated conductive body which is fitted with aligned bushings **3** and **5** retained in position by screws **7** which project into annular grooves **9** in the outer surface of the bushings. A passage or bore **13** extends through the bushings and body. The portion of the passage **13** in bushing **3** has close fitting engagement with the outer surface of an electrical cable, such as **15** in FIGS. 4 and 5, from which the outer semi-conducting material **17** is to be removed. The portion **14** of the passage **13** in body **1** and the portion **16** in bushing **5** are only slightly larger in diameter than the insulation **21** of the cable **15**. The bushing **5** may be omitted, if desired, when the portion **14** of the passage **13** fits so closely around the insulation that the cable cannot move laterally far enough for the blade to gouge the insulation.

The body **1** is cut away transversely to provide a recess **23** which extends across and intersects with the passage **13**. As shown recess **23** makes an angle of about 5° with

the longitudinal centerline of the portion of the passage **13** in the body **1**. A cutting tool **25** is positioned in recess **23** and is firmly secured in place against movement in use, as by a screw **27** which extends through slot **29** in the blade and has screw threaded engagement in the body.

The blade **25** is provided with a first cutting edge **31** and a second cutting edge **33**. These two edges are disposed at a wide included angle to one another and when the blade is positioned in the body, as in FIGS. 1–3, the longer cutting edge **31** will lie on a plane substantially parallel to the centerline of the passage **13** and of the cable positioned in bushing **3** while the shorter cutting edge **33** will lie in a plane transverse to that centerline.

The blade **25** has a plane bottom surface **35** which rests on the body, as shown in FIG. 2, and is cut away from the longer edge **31** to form an upwardly extending inclined surface **37** which makes a small angle, for example, from about 25° to about 35° with the bottom surface **35** of the blade. The blade **25** is also cut away to form a surface **39** which makes a small angle, for example, between about 25° and about 35° with the adjacent side of the blade. Thus the blade, as is shown in FIG. 6, has long and short cutting edges **31** and **33** which make a wide included substantially right angle with one another and have a common end. The sloping surfaces **37** and **39** serve to direct away from the cutting edges material severed by the latter from a cable.

It will be understood that when it is desired to remove the outer layer **17** of semi-conductive material from an electrically conductive cable, such as that shown at **15** in FIG. 4, the blade **25** will be positioned with its cutting edge **31** substantially tangent to the circle defining the inner surface of the outer layer of semi-conductive material **17**, i.e., between that layer and the layer of insulation **21** which surrounds the inner layer **41** of semi-conductive material immediately enclosing the conductor **43**. When a cable having a close sliding fit in the passage or bore **13** of bushing **3** is inserted in that bore and the tool is rotated to advance the cutting edge **31** against the material and is moved axially relative to the cable, that edge will sever the outer layer of semi-conductive material **17** from the insulation **21** and the cutting edge **33** will sever that layer transversely and the resulting endless chip will move along surfaces **37** and **39** and thence out of the body **1**.

It will be noted that the recess **23** in which blade **25** is mounted is of substantial width. Recess **23** should be wide enough to insure free passage of the chip out of the tool. For a cable of about 1" in diameter, a suitable width of blade **25** is about ½". As the cable diameters increase, the blade width should increase. For a cable of about 2" in diameter, a suitable width of blade **25** would be about ¾". As stated above, the recess **23** of FIG. 1 makes an angle of about 5° with the longitudinal centerline of the passage **13**. That angularity is suitable for cables of the smaller diameters, for example, about 1" but should decrease as the cable diameter increases, i.e., to about 0° with cable diameters of about 2½". Since the effort to remove the material increases with the width of the chip, the angularity of the recess should decrease as the diameter of the cable increases to keep the required effort in a small range. It is to be understood that, when desired, the recess **23** may be substantially at a right angle to the longitudinal centerline of the passage **13**.

In the modification shown in FIGS. 7 and 8, the blade **25** is secured, as by screw **46**, to a carrier **47** which may be secured to body **1** in adjusted positions by a screw **49** extending through elongated hole **48** and into the body to locate the cutting edge **31** tangent to the inner circumference of the material to be removed from cables of a small range of diameters.

The cutting blade **65** shown in FIGS. 9 to 13, inclusive, may be used to remove the outer layer of semi-conductive material but is particularly adapted to removal of the outer layer of semi-conductive material and the layer of insulation, or both layers with the inner layer of semi-conductive material without nicking the conductor. The tool of FIGS. 9 to 13 includes an elongated cylindrical body **51** fitted with a bushing **53** which has a passage or bore **55** only slightly greater than the outside diameter of the cable from which material is to be removed so that the cable has a close sliding fit in the bushing. The bushing is held securely in fixed position in the body by any suitable means, for example, a screw **57** which has threaded engagement in the body and projects into an annular recess **59** in the bushing. At one end of body **51** is positioned a blade **65** which is held in place on the body by screw **67** which extends through slot **69** in the blade.

The blade **65** is provided with a plane lower surface **71** which seats in a recess **72** in the end of body **51** and is inclined at a small angle, for example, between about 2° and about 5° to the longitudinal centerline of the bore in bushing **53**. The blade has a long cutting edge **73** and a short cutting edge **75** which edges make a wide, included, substantially right angle with one another and have a common end. The surface of the blade slopes upwardly from the lower surface **71** as at **77**, and slopes transversely from the adjacent side surface of the blade, as at **79**. The surfaces **77** and **79** make angles of between about 25° and about 35° with the bottom and side surfaces of the blade.

When only the outer layer of semi-conductive material **83** is to be removed from a cable, such as **81** of FIG. 9, the blade **65** is positioned with its bottom surface **71** in contact with the sloping surface of recess **72** of the tool and with the short cutting edge **75** positioned parallel to the longitudinal centerline of the bore in bushing **53** and substantially tangent to the inner surface of the outer layer of semi-conductive material and with the longer edge **73** positioned transversely to that centerline. The cable is then inserted in the bore **55** of bushing **53** and the tool and cable are moved relatively rotationally against the cutting edges **73** and **75** and longitudinally with the result that the outer layer of semi-conductive material **83** is cut transversely through and severed from the layer of insulation **85** and the resulting ribbon or chip of material moves along surfaces **77** and **79** and thence away from the tool.

When both the outer layer of semi-conductive material and the layer of insulation are to be removed, the blade is adjusted to position edge **75** of the blade tangent to the inner surface of the insulation. When it is desired to remove the inner layer of semi-conductive material **86** (FIG. 12) as well as the other two layers, the blade is positioned with cutting edge **75** tangent to a circle enclosing the conductor **89**.

It will be understood that the tool of either the modification of FIGS. 1 to 8 oro that of FIGS. 9 to 12 may be used with cables which differ in diameter but since it is important that in each instance the cable should have a close sliding fit in the tool and that the cutting edges should be positioned with exactness, the range of sizes of fication of FIGS. 1 to 8 or that of FIGS. 9 to 12 may be cable from which material may be removed with any given tool is quite limited. By providing bushings with bores ranging from about ½" to about 1⅛" in diameter, and mounting the tool adjustably on the body in any suitable manner, for example, as shown in FIGS. 7 and 8, the outer layer of semi-conductive material and insulation may be removed from cables ranging in diameter from about ½" to about 1⅛".

Since there are cables larger than 1½" and it is preferable, economically, to restrict the costs of the blade holders of the tools, two or more additional sizes of holders may be used. For example, one holder would take cables ranging from about ¾" to about 1½" and another holder would take cables ranging from about 1" to 1¾". Of course, these ranges may be varied as desired.

FIG. 14 shows a modified form of cutting blade **90** which is preferable in certain respects to blade **25** of

FIG. 6 and blade **65** of FIG. 13. Cutting blade **90** consists of a flat, thin body portion **91** and a flat thin flange portion **92** at one of the body portion **91**. One edge of body portion **91** is beveled as at **93** and forms a cutting edge **95** at the intersection of that surface with the flat undersurface **97** of body portion **91**. Flange portion **92** has an outer surface **98** and a beveled surface **99** corresponding to the beveled surface **93** and forming a cutting edge **101** at the intersection of the beveled surface **99** with surface **98**. At the other end of portion **91** a notch **106** is formed for a securing bolt. It will be noted that the long and short cutting edges **95** and **101** make a wide included substantially right angle with one another and have a common end point indicated at **105**.

The cutting blade shown in FIG. 15 resembles the blades of FIGS. 13 and 14 but differs from each one in certain respects. The blade **110** of FIG. 15 includes a flat thin body portion **112** and a thin flange **114** at one end thereof. The body portion is beveled along one edge as at **116**, making an angle of between about 25° and about 35° with the bottom surface of body **110**. The end of flange **114** is similarly beveled as at **118**. The inner surface **120** of flange **114** makes an included angle of about 90° with the top surface of body **110**. The outer surface of flange **114** is inclined at an angle to surface **120**. The edge **122** on body **110** and edge **124** on flange **114** have a common end and make a wide included angle, for example, from about 70° to about 85°. Notch **126** serves to receive a securing bolt such as bolt **67** of FIG. 11.

It will be understood that cutting blades **90** or **110** may be used in lieu of blades **25** or **65** as desired.

It will be understood that the shorter cutting edges of blades **25**, **65**, **90** and **110** should be at least as long as the longitudinal thickness of the chip or ribbon of covering material being removed from the cable; and that the longer cutting edges of those blades should be at least as long as the radial or transverse thickness of the material being removed. Accordingly, the longer cutting edge will be at least twice and usually several times as long as the shorter cutting edge.

Having thus described this invention in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains to make and use the same, and having set forth the best mode contemplated or carrying out this invention, I state that the subject matter which I regard as being my invention is particularly pointed out and distinctly claimed in what is claimed, it being understood that equivalents or modifications of, or substitutions for, parts of the above specifically described embodiments of the invention may be made without departing from the scope of the invention as set forth in what is claimed.

What is claimed is:

1. A hand tool for removing covering material from an electrically conductive cable which comprises an elongated cylindrical body having a longitudinal passage whose inlet end is only slightly larger in diameter than that of the cable from which covering material is to be removed so that the cable will have a close sliding fit in

that end of the passage, and a blade fixedly secured to the tool against variation of position in use and having two cutting edges of different lengths with one edge being disposed in a plane transverse to the centerline of the passage and with the other cutting edge disposed in a plane substantially parallel to the centerline of the passage and substantially tangent to the inner circumference of the material to be removed.

2. The tool set forth in claim **1** in which a bushing in the body forms the inlet end of said passage.

3. The tool set forth in claim **1** in which an opening in the body beyond the blade forms a part of said passage and has a diameter only slightly larger than that of the cable after the removal of covering material therefrom by said cutting blade.

4. The tool set forth in claim **1** in which a bushing in the body forms the outlet end of said passage.

5. The tool set forth in claim **4** in which the bushing forming the outlet end of said passage has an internal diameter only slightly larger than that of the cable after removal of the covering material therefrom by the cutting blade.

6. The tool set forth in claim **1** in which the longer cutting edge of the blade is disposed in a plane at substantially right angles to the centerline of said passage.

7. The tool set forth in claim **1** in which the longer cutting edge of the blade is disposed in a plane substantially parallel to the centerline of said passage.

8. The tool set forth in claim **1** in which the cutting edge of the blade which is substantially parallel to the centerline of the cable is positioned substantially tangent to a circle defining the outermost surface of the conductor of the cable.

9. The tool set forth in claim **1** in which the blade is fixedly mounted on a carrier and the carrier is adjustably attached to the body to position one cutting edge substantially tangent to the inner surface of the layer of covering material to be removed from a cable.

10. The tool set forth in claim **1** in which the blade consists of a flat thin body having a plane bottom surface and a thin flange at one end thereof having a plane outer side surface, the blade being beveled at angles of about 25° to about 35° with said bottom and side surfaces and forming a long cutting edge on the body and a short cutting edge on the flange.

References Cited

UNITED STATES PATENTS

3,377,891	4/1968	Horrocks	81—9.5 C
3,398,610	8/1968	Matthews	81—9.5 C

ROBERT C. RIORDON, Primary Examiner

R. V. PARKER, JR., Assistant Examiner

U.S. Cl. X.R.

30—90.1; 145—3.1