March 25, 1969 J. L. MIXON, JR 3,434,511

TOOL FOR SECURING A CABLE TO AN ELECTRICAL CONNECTOR

Filed March 27, 1967 Sheet 1 of 2

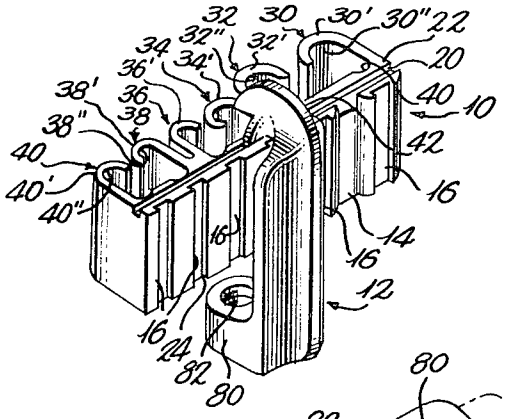
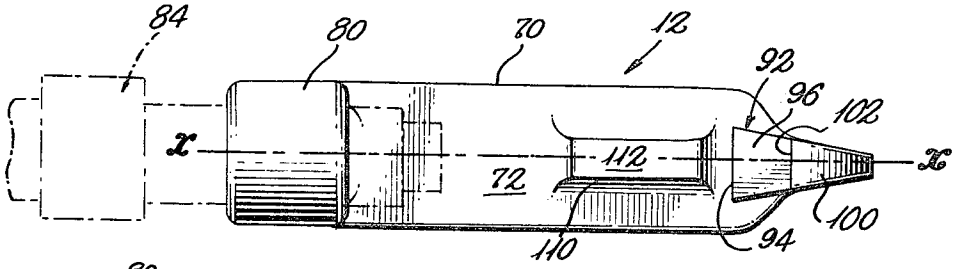


Fig. 1.

Fig. 2.

Fig. 3.



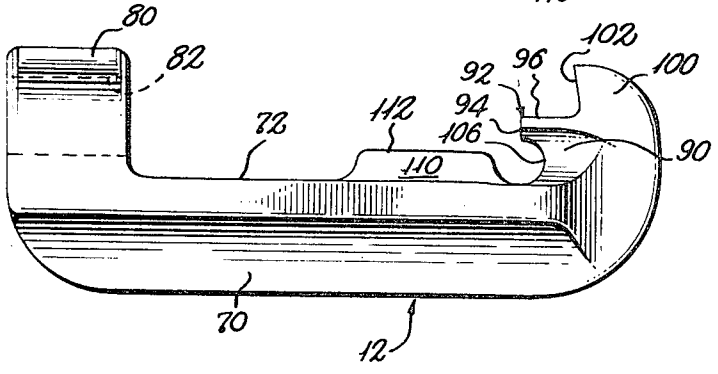


Fig. 4.

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Fig. 5.

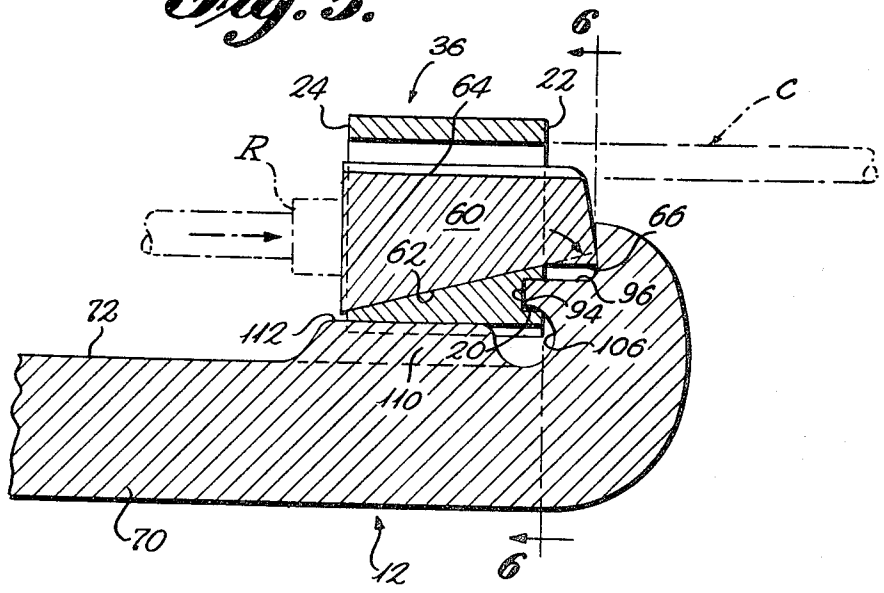


Fig. 6.

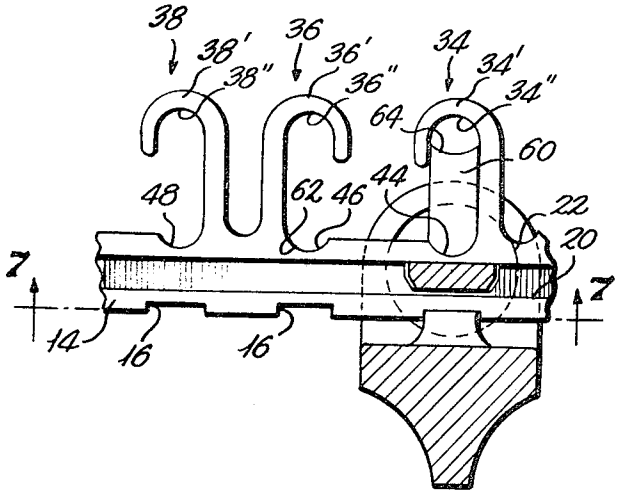
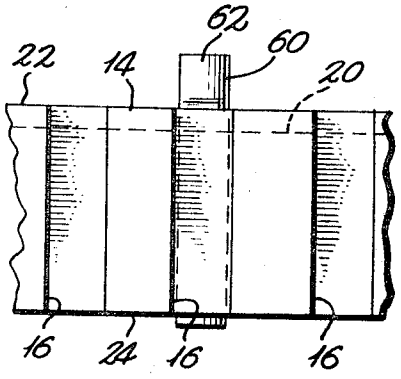


Fig. 7.



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3,434,511

TOOL FOR SECURING A CABLE TO AN ELECTRICAL CONNECTOR

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Int. Cl. B21f 7/00, 15/02; H01s 5/00
U.S. Cl. 140—117 9 Claims

ABSTRACT OF THE DISCLOSURE

The tool comprises a rigid body means including a main elongated portion having a flat surface at one side thereof. A mounting portion extends laterally from the flat surface at one end of the body means and has a threaded hole formed therethrough for mounting a power unit therein, the power unit being adapted to drive a clamp member into place in an associated connector. The axis of the threaded hole is substantially parallel with the axis of the main elongated body portion. An integral lip means is formed on the opposite end of the body means and is offset laterally from said flat surface so as to be substantially aligned with the axis of the threaded hole. The body means includes a curved surface adjacent the lip means to provide clearance with an associated connector. An integral elongated rib is formed on the main elongated body portion and extends laterally from said flat surface. The rib is disposed adjacent the lip means and remote from the mounting portion and extends in a direction substantially parallel with the axis of said hole. The body means also includes an integral impact portion thereon adjacent to the lip means and spaced longitudinally from the lip means in a direction away from the mounting portion. The impact portion is offset laterally to a greater extent than said lip means and defines an impact surface inclined at an angle to the longitudinal axis of said threaded hole as well as the longitudinal axis of the main elongated body portion.

Background of the invention

The tool of the present invention is adapted to be used in conjunction with a connector wherein individual clamp members are driven into place by an explosive unit, the tool of the present invention operatively fitting on certain portions of the connector so as to properly mount the explosive unit to drive a clamp member into place.

The tool of the present invention is specifically adapted for use with a particular type of electrical connector as described hereinafter, the connector including portions which cooperate with the tool to position the tool on the connector in the desired manner. A tool for a similar purpose is illustrated for example in U.S. Patent 3,212,534 wherein the tool is adapted for use with a connector body of generally C-shaped cross sectional configuration. The tool as shown in this patent is specifically designed for use with a particular type of connector and simply would not be suitable for use with the type of connector contemplated in the present invention.

Prior art tools such as shown in the aforementioned U.S. patent do not incorporate a construction which would enable the tool to be properly aligned and held in place relative to the particular type of connector with which the tool of the present invention is used.

Additionally, prior art tools such as shown in the aforementioned U.S. patent do not provide a means for positively locking the wedge or clamp members in place once they have been driven home to thereby ensure that the electrical connection cannot accidentally slip or be broken.

Summary of the invention

The tool of the present invention incorporates a lip means and an elongated rib in particular interrelationship with the remaining components of the body means so that the tool may be fitted into cooperating portions of a particular type of electrical connector so as to accurately and properly align and hold the tool in place when it is desired to drive a clamp member into clamping position.

Additionally, the tool of the present invention includes an impact portion defining an impact surface which is adapted to engage a part of the clamp member as it is driven home so as to peen the end of the clamp member over so as to positively lock the clamp member in place relative to the associated electrical cable and the connector to prevent the connection from accidentally slipping or being broken.

Brief description of the drawings

FIG. 1 is a top perspective view illustrating the tool of the present invention in engagement with a particular type of electrical connector;

FIG. 2 is a top perspective view on an enlarged scale illustrating the tool of the present invention;

FIG. 3 is a top view of the tool illustrated in FIG. 2;

FIG. 4 is a front view of the tool as seen in FIG. 3;

FIG. 5 is a sectional view through an electrical connector in one end of the associated tool of the present invention illustrating a clamp member driven into clamping position;

FIG. 6 is a sectional view taken substantially along line 6—6 of FIG. 5 looking in the direction of the arrows; and

FIG. 7 is a view taken substantially along line 7—7 of FIG. 6 looking in the direction of the arrows.

Description of the preferred embodiment

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, FIG. 1 illustrates an electrical connector indicated generally by reference numeral **10** and the tool of the present invention indicated generally by reference numeral **12** operatively associated therewith. The electrical connector **10** is of the type disclosed in copending U.S. patent application Ser. No. 611,132, filed Jan. 23, 1967. The conductor is formed of a suitable electrically conductive substance such as aluminum or the like and comprises a main body portion **14** having a plurality of grooves **16** formed in the rear surface thereof. The body means also has a longitudinally extending channel **20** formed in the upwardly facing surface **22** thereof as seen in the drawings. The opposite surface of the body means is indicated by reference numeral **24**.

As seen in FIG. 1, the main body portion **14** of the connector includes integral outwardly extending portions **30, 32, 34, 36, 38** and **40**, each of these portions extending substantially normally from the main body portion. As seen most clearly in both FIGS. 1 and 6, the outwardly extending portions **30–40** inclusive terminate in curved portions **30′, 32′, 34′, 36′, 38′** and **40′** defining inner surfaces **30″, 32″, 34″, 36″, 38″** and **40″** respectively of generally arcuate cross sectional confiiguration. A line extending downwardly along each of these last-mentioned surfaces is disposed substantially parallel with the rear surface of the main body portion **14**, these generally arcuate surfaces as well as the other arcuate surfaces of the connector described hereinafter defining portions of a substantially cylindrical surface.

A plurality of generally arcuate surfaces **40, 42, 44, 46, 48** and **50** are formed on the main body portion **14** in opposed facing relationship to the surfaces **30″, 32″, 34″, 36″, 38″** and **40″** respectively. Accordingly, six pairs of

opposed facing surfaces are provided. Each of surfaces **40–50** inclusive tapers in a direction from surface **24** toward surface **22** of the body means of the connector so as to define a tapering space between these surfaces as seen most clearly in FIG. 5, the space getting progressively smaller when proceeding from surface **24** toward surface **22** of the body means. The outwardly extending portions **30** and **32** are of greater size and curvature than the remaining four outwardly extending portions.

A clamp member is adapted to be driven into each of the tapered spaces defined by the connector, and a typical clamp member is illustrated in operative position in FIG. 5 of the drawings.

The clamp member is indicated by reference numeral **60** and has opposite edge portions **62** and **64** each of which is of generally arcuate cross sectional configuration. Edge portion **62** tapers from the left-hand end of the clamp member as seen in FIG. 5 toward the opposite end thereof so as to slope toward the edge portion **64**. The slope of edge portion **62** and the taper of the clamp member are complementary to the slope of the tapered space defined by outwardly extending portion **36** of the body means whereby the clamp member is in its over-all construction complementary to the tapered space defined by the opposed facing surfaces of the body means as aforedescribed.

Edge portion **62** of the clamp member is adapted to fit snugly within sloping surface **46** of the body means, while the opposite edge portion **64** is adapted to clamp the bared end of a cable against the surface **36''** of portion **36** of the body means.

As seen in FIG. 5, a cable C is illustrated as being clamped in operative position between clamp member **60** and the outwardly extending portion **36**. It should be noted that edge portion **62** is originally straight and extends along the phantom line as indicated in FIG. 5, but that this edge portion has been peened over as indicated at **66** by the tool hereinafter described when the clamp member is driven home as will be apparent from the following description.

While a single clamp member has been illustrated as being disposed in operative position within the connector, it will be understood that similar clamp members may be employed with each of the outwardly extending portions of the connector, larger clamp members being employed with the portions **30** and **32** as will be apparent.

As the clamp members are driven into the tapered spaces defined by the outwardly extending portions of the connector, the cooperation of the sloping surfaces formed on the clamp members and the connector will cause the clamp members to wedge the bared ends of cables tightly against the associated body portions to firmly lock the cables to the connector to provide a good mechanical and electrical interconnection.

Referring now to FIGS. 2–4 inclusive, the tool **12** comprises a rigid body means formed of steel or the like including a main elongated body portion **70** having a longitudinal axis *x*—*x* as seen in FIG. 3, this body portion having a substantially flat surface **72** formed on one side thereof.

The body means includes an integral mounting portion **80** at one end thereof which extends substantially perpendicular to the flat surface **72**. Mounting portion **80** has a threaded hole **82** formed therethrough which serves to mount a power unit indicated by phantom line **84**, this power unit being substantially identical with the structure identified as the firing mechanism F in U.S. Patent 3,212,534. This mechanism is provided with a screw-threaded outer surface adapted to be received within the threaded hole **82** of the mounting portion for operatively mounting the power unit in position. The axis of hole **82** extends substantially parallel with the longitudinal axis of the tool **12**.

At the opposite end of the tool, an integral portion **90** extends laterally and substantially perpendicularly from flat surface **72**, this portion **90** flaring upwardly and toward the mounting portion **80** to define a lip means indicated generally by reference numeral **92**. This lip means includes a flat terminal end surface **94** and a side surface **96** which is also flat and which is disposed substantially perpendicular to the end surface **94**.

An impact portion **100** extends laterally outwardly from portion **90** of the body means and defines an impact surface **102**. This impact surface as seen most clearly in FIG. 4 is inclined at an angle to the axis of hole **82** as well as the longitudinal axis of the tool.

The body means includes an integral rib **110** of elongated configuration, this rib being of less width than the width of flat surface **72** as clearly seen in FIGS. 2 and 3, the rib extending laterally from flat surface **72**. The long dimension of rib **112** extends in a direction substantially parallel with the axis of hole **82** as well as the longitudinal axis of the tool. The rib is positioned intermediate the mounting portion **80** and the lip means **92**, and is disposed adjacent the lip means and remote from the mounting portion.

As seen most clearly in FIG. 3, it will be noted that the lip means as well as the rib and the impact portion are all disposed so as to be substantially symmetrical about the longitudinal axis *x*—*x* of the tool, and these components are also disposed so as to be symmetrical about a line extending parallel with the axis of the hole in the mounting portion **80**. As seen in FIG. 4, the lip means **92** is substantially aligned with the axis of hole **82** of the mounting portion. It is also apparent from an inspection of this figure that the mounting portion, the rib, the lip means and the impact portion are all offset laterally of the main elongated body portion **70** at one side thereof, these elements extending laterally from the flat surface **72**.

When it is desired to drive a clamp member into place in the connector, an explosive unit **84** is operatively connected with tool **12** by threading it into place in the threaded hole **82** of the mounting portion **80**.

Let us assume that it is desired to drive a clamp member **60** into place within the outwardly extending portion **36** of the connector. The tool **12** is properly aligned and held in place with respect to the connector by placing lip means **92** within the channel **20** of the connector and by simultaneously placing rib **110** within the groove **16** of the connector which is aligned with the outwardly extending portion **36** of the connector. It will be noted that each of the grooves **16** is aligned with one of these outwardly extending portions. The tool **12** is disclosed in this operative position in FIGS. 1 and 6.

As seen particularly in FIG. 6, when the tool is disposed in operative relationship with respect to the connector, the flat surface **112** of the rib **110** will be disposed in contact with the bottom wall of the associated groove, and as seen in FIG. 5, the flat end surface **94** of lip means **92** rests upon the bottom wall of channel **20**.

It will also be noted as seen in FIG. 5 that the surface **96** of the lip means is adapted to engage the associated side wall of channel **20** in the body means of the connector when the components are operatively positioned in contact with one another.

It will further be noted in FIG. 5 that when the tool is operatively associated with the connector, the curved outer surface **106** of the tool provides adequate clearance with the adjacent portion of the connector to permit the tool to be moved into the proper operative position.

Afer the tool has been positioned on the connector, the clamp member is initially manually inserted with the bared end of a cable in place. The power unit can then be actuated so as to drive the ram portion thereof forward into the position shown in FIG. 5 wherein the ram indicated by phantom line R has driven the clamp member **60** all the way into its clamping position. As the clamp member moves into this position, the right-hand end thereof will engage the impact surface **102** of the tool so as to peen the portion **66** of the clamp member over as indicated

in FIG. 5 thereby positively locking the clamp member in operative position.

After the clamp member has been driven into the clamping position illustrated in FIG. 5, the tool can be removed for use with other portions of the connector as required.

It is apparent from the foregoing that there is provided according to the present invention a new and novel tool for securing the cable to an electrical connector incorporating means for properly aligning and holding the tool in place relative to the connector and further wherein the tool includes means to peen over an edge of the clamp member driven into the connector to lock the clamp member in position.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. A tool for securing a cable to an electrical connector comprising a rigid body means including a main elongated portion, an integral mounting portion at one end of said main elongated body portion, said mounting portion having a threaded hole formed therethrough for mounting a power unit on the body means, the axis of the hole being substantially parallel with the longitudinal axis of said main elongated body portion, said body means including an integral lip means at the opposite end of said main elongated body portion, said lip means being substantially aligned with the axis of said hole, said body means including an integral elongated rib extending in a direction substantially parallel with the axis of said hole, said rib being formed on said main elongated body portion at a point intermediate said mounting portion and said lip means, said rib extending laterally from said main elongated body portion to be offset laterally therefrom, said mounting portion and said lip means also being offset laterally of said main elongated body portion on the same side as said rib.

2. Apparatus as defined in claim 1 wherein said rib is formed on the body means adjacent to said lip means and remote from said mounting portion, said lip means being offset laterally from said main elongated body portion to a greater extent than said rib.

3. Apparatus as defined in claim 1 wherein said body means defines a curved outer surface adjacent said lip means to provide clearance with an associated connector.

4. Apparatus as defined in claim 1 wherein said body means includes an integral impact portion disposed adjacent said lip means and spaced longitudinally of said lip means in a direction away from said mounting portion.

5. Apparatus as defined in claim 4 wherein said impact portion of the body means is offset laterally from said main elongated body portion on the same side as said lip means and is offset to a greater extent than said lip means.

6. Apparatus as defined in claim 5 wherein said impact portion defines a surface inclined at an angle to the longitudinal axis of said hole as well as the longitudinal axis of said main elongated body portion.

7. Apparatus as defined in claim 1 wherein said body means defines a substantially flat surface at one side thereof, said mounting portion, said lip means and said rib being offset laterally from said flat surface, said rib having a width substantially less than the width of said flat surface.

8. Apparatus as defined in claim 7 wherein said rib is positioned adjacent said lip means and remote from said mounting portion, said body means defining a curved outer surface adjacent said lip means to provide clearance with an associated connector, said body means including an integral impact portion adjacent said lip means, the impact portion being spaced longitudinally from said lip means in a direction away from said mounting portion, said impact portion being offset laterally from said main elongated body portion to a greater extent than said lip means.

9. Apparatus as defined in claim 8 wherein said impact portion defines a substantially flat impact surface inclined at an angle to the longitudinal axis of said hole as well as to the longitudinal axis of said main elongated body portion.

References Cited

UNITED STATES PATENTS

3,163,200	12/1964	Broske et al.	72—412
3,212,534	10/1965	Broske	140—113
3,212,535	10/1965	Broske	140—113
3,268,991	8/1966	Beinhaur	29—203
3,280,856	10/1966	Broske et al.	140—113
3,293,732	12/1966	Broske	29—421
3,296,792	1/1967	Hedberg et al.	140—113
3,325,885	6/1967	Ziegler et al.	29—203
3,368,267	2/1968	Hedberg	29—203

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U.S. Cl. X.R.

29—203; 140—111