

[54] **HAND TOOL FOR CRIMPING, CUTTING
AND STRIPPING**

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[58] Field of Search..... **7/5.4, 5.5, 5.1,
7/5.2, 5.3; 81/9.5 R; 72/410; 30/90.1**

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[57]

ABSTRACT

A hand tool for performing a variety of functions, such as terminal crimping, wire cutting, insulation stripping, etc., with regard to electrical connection terminal assemblies and the like. The tool comprises a pair of pivotal jaw members with circular crimping means in its nose portion and a guide means adjacent the ferrule crimping means. The tool also is provided with bolt and screw cutting means, including screw threaded work-holding apparatus and arcuate shears adapted to cut through the bolts or screws while they are held in the threaded holes. In addition, the tool is provided with a cam-like terminal lug crimping means for ignition cable and with a wire cut-off means whereby the cut-off blade has angular ends to provide space for squeezed out insulation that prevents cutting of conductor and insulation. The tool also has wire stripping apertures, and these, similarly to the bolt and screw work-holding apertures, are arranged so that the larger apertures are closer to the pivot point of the tool, whereby a greater mechanical advantage is utilized for the heavier work pieces.

6 Claims, 6 Drawing Figures

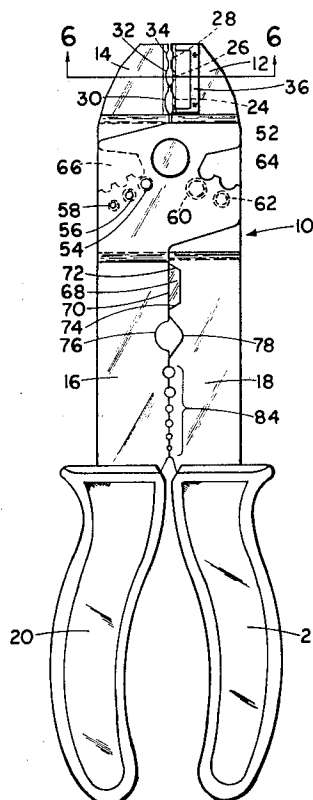


FIG. 1

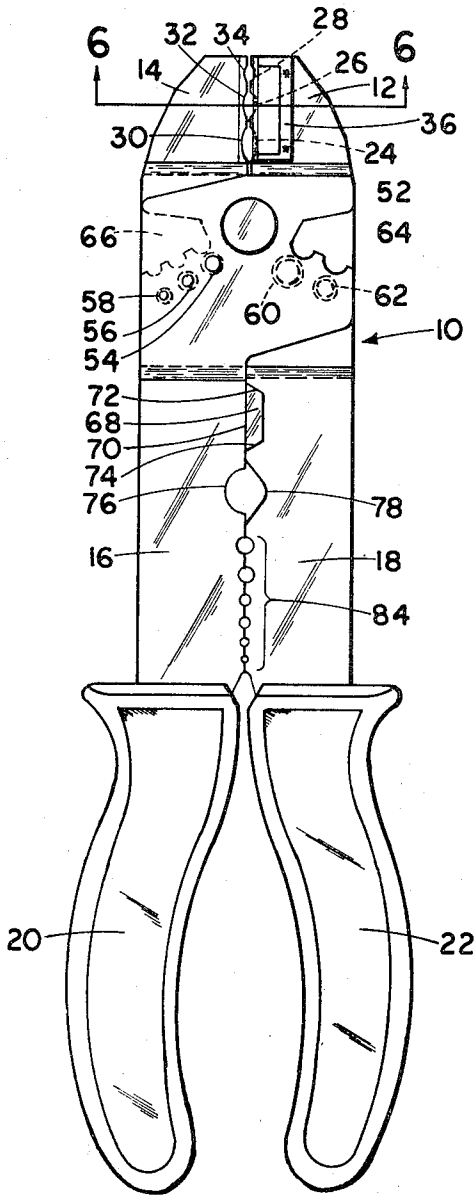


FIG. 2

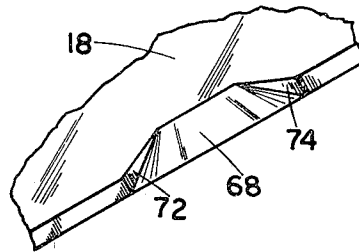


FIG. 3

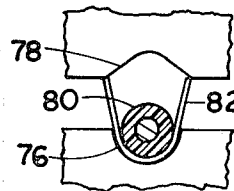


FIG. 4

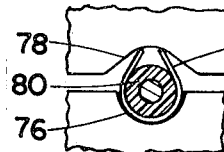


FIG. 5

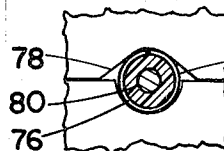
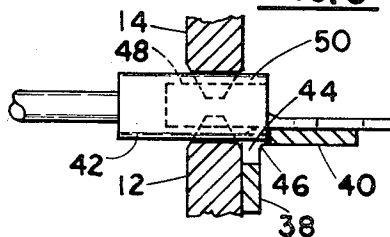


FIG. 6



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HAND TOOL FOR CRIMPING, CUTTING AND STRIPPING

This invention relates to a hand tool for performing a variety of functions with regard to terminal assemblies and the like, and it particularly relates to a tool for crimping terminal lugs, stripping and cutting wires, cutting bolts and screws, etc.

Hand tools for crimping, cutting, stripping, etc., have heretofore been known. However, these prior tools generally had one or more inherent defects. For example, they generally required an undue amount of physical force when used to strip or cut heavier wires, and to cut screws or bolts, such as are used in cable connections. They, furthermore, either did not provide for accurate alignment of the solderless lug within the tool to provide crimping on the narrow section of the lug or other device being crimped, or used an alignment means which was subject to easy breakage or which was not adapted for all sizes of lugs or the like. As regards the cutting means for screws or bolts, these generally either utilized a slicing action which left undesirable burrs on the screw or bolt, or they utilized apertures or holes as the shearing means. These holes not only required accurate alignment with the workholding holes in which the screws or bolts had to be held during the shearing action, but the holes rather quickly became elongated or misshapen and there was no feasible way to dress them into proper shape again.

It is one object of the present invention to overcome the above and other defects of prior tools of this type by providing a hand tool which is adapted to crimp, cut or strip both lighter and heavier cables, wires, screws, bolts, and the like with very little variation in force required.

Another object of the present invention is to provide an alignment means for the crimping portion of the tool which is simple in construction and effective for all types and sizes of lugs or the like which can be crimped by the tool.

Another object of the present invention is to provide a tool of the aforesaid type wherein the screw or bolt shearing means avoids the formation of burrs and can be easily dressed into proper shape if it should become distorted or misshapen during use.

Other objects and many of the attendant advantages of this invention will be readily appreciated as it becomes better understood by reference to the following description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a front elevational view of a tool embodying the present invention.

FIG. 2 is a perspective view of the wire cutting means.

FIGS. 3, 4 and 5 are sectional views showing the progressive crimping action on ignition cable, solderless connectors or the like.

FIG. 6 is a sectional view taken on line 6—6 of FIG. 1 and showing a solderless lug properly positioned to be crimped.

Referring now in greater detail to the figures of the drawings wherein similar reference characters refer to similar parts, there is shown in FIG. 1 a tool, generally designated 10, comprising a nose portion that includes a pair of jaw members 12 and 14. The jaw 12 is integral with a stem 16 and the jaw 14 is integral with a stem 18. A handle 20 is provided on stem 16 and a handle 22 is provided on stem 18.

The jaw 12 is provided with arcuate portions 24, 26 and 28 forming ferrule crimping die portions, and these co-act with similar but opposed die portions 30, 32 and 34 on the jaw 14. These die portions are used in the standard manner.

Adjacent the ferrule crimping dies, on the front face of the jaw 12 is positioned a lug positioning member 36. As best shown in FIG. 6, the lug positioning member 36 is in the form of a right-angle shaped plate with the vertical leg 38 spot-welded onto, in proper juxtaposition, or otherwise connected to the jaw face. The horizontal leg 40 forms a rest or platform for supporting and properly positioning the workpiece, here shown as a solderless lug 42, which is being crimped. An enclosed slot 44 extends lengthwise along the arcuate crimping jaws between the leg 38 and the supporting platform 40. The inside horizontal raised edge 46 of the slot 44 acts as a stop against which the cylindrical portion of the workpiece 42, namely, the solderless lug which has its cylindrical portion comprising an internal crimping barrel 48 and an external insulation sleeve 50, rests.

The guide 36 is always in position and requires no pivotal or other movable adjustment to bring it into and out of operative position. Therefore, there is no danger of pivot-forming rivets or the like becoming loose or breaking off. Furthermore, the guide 36 is in operative position to handle workpieces of all sizes, whether being crimped between dies 24—30, 26 32 or 28—34.

The guide 36 acts to precisely position the workpiece so that when the internal conductor is gripped by the crimped barrel 48, the latter is precisely centered within the appropriate crimping jaws and there is no danger of missing the barrel, which may cause a faulty electrical connection and damage the insulating sleeve 50. It avoids defective and loose crimpings which result in poor conductivity. It provides for placing the crimp in the most effective area. It prevents the exposed metal of the lug from turning, bending, tilting or shifting out of line. It provides uniform crimping of all types and sizes of lugs. It eliminates guesswork in correctly locating the workpiece in position. It gives better visibility of the crimping action and relationship of the conductor within the lug relative to the exposed end of the conductor. It eliminates fumbling and need for a third hand to hold the workpiece in position during crimping. It automatically aligns the crimping area on the lug with the crimping jaws even though the insulation hides the interior barrel. It properly aligns the seam in the barrel of the lug with the crimping jaws to firmly hold the seam against the conductor, thereby preventing subsequent inadvertent opening of the seam. It prevents the lug from rotating during the crimping. Finally, it does not interfere with different types of lugs, and can be used for both insulated and uninsulated lugs.

The jaws 12 and 14 are pivotally connected by a rivet or the like indicated at 52. The jaw 12 has a set of internally threaded apertures, diagonal to the pivot 52. This set includes apertures 54, 56 and 58. The jaw 14 has another set of apertures diagonal to the pivot 52 and this second set includes apertures 60 and 62. It is to be noted that the apertures 54, 56 and 58 of one set are of progressively smaller diameters while the aperture 60 of the other set is larger than the aperture 62. Co-acting with these two sets of threaded apertures are shearing recesses respectively designated 64 and 66. The recess 64 is provided on the outer face of jaw 12

in opposition to apertures 60 and 62, while the recess 66 is mounted on the outer face of jaw 14 in opposition to apertures 54, 56 and 58.

When screws or bolts are to be cut, they are thread-
edly inserted into the proper threaded aperture, ac-
cording to their diameter thread size numbers while the
jaws are open. When the jaws are brought together, the
recesses 64 and 66 pass, in a shearing action, to sever
the exposed ends of the nuts or bolts. It is to be noted
that the shearing edges are not sharpened like a knife
and, therefore, do not slice through the workpieces,
but, instead, act to displace in shear the section to be
cut off from the held section. This displacement or
"shearing" action exerts a constant force that avoids
formation of burrs, whereas a slicing action tends to lift
the knife up at the end of the slicing action, especially
if the knife is somewhat dull; and this uplift forms a
burr.

The fact that the larger apertures are closer to the
pivot 52 is also important because the closer the work-
piece is to the pivot point, the greater is the mechanical
advantage. Since the thicker workpieces require
greater force, the fact that they are positioned closer to
the fulcrum results in less force being required than if
they were farther away.

The arcuate shear 64 and 66, being on the outer faces
of their respective jaws, are easily accessible. If these
segments should become in any way distorted or mis-
aligned, they can easily be dressed back into the proper
shape. This, obviously, cannot be done with cutting ap-
ertures or holes such as have heretofore been used.
Furthermore, it is not necessary to maintain such accu-
rate alignment between the segments and the work-
holding apertures, as is necessary where alignment of
corresponding holes are used.

Below the jaws 12 and 14, on the stems 16 and 18,
are provided cooperating blade and anvil means for
cutting wires or cables. This cutting means comprises
a blade 68 on stem 18 and an anvil 70 on stem 16. It
is to be noted that the blade 68 has outwardly extend-
ing angular upper and lower edges, as at 72 and 74.
These angular edges are important because if a
straight-edged blade is used, it first acts to squeeze the
insulation around the wire outwardly. These squeezed-
together outer portions form barriers between the
stems 16 and 18 against the further movement of the
blade to cut through the conductor wire because, at the
outside the cutting area of the blade has no cutting ac-
tion. When the blade has angled edges as in the present
invention, it provides space for the squeezed-out insu-
lation while the forward movement of the blade pushes
the insulation inwardly and confines it to the area of the
greatest cutting action.

Below the wire cutting portion is a forming and a
crimping die portion defined by an anvil edge 76 and
a crimping edge 78. This portion is used for the crimp-
ing of the terminal lugs onto ignition cables. The edge
76 is of the shape and size of the lug around the cable.
This is best shown in FIGS. 3, 4 and 5, the cable being
designated 80. The edge 78 has a predetermined cam-
like contour which is so formed that it acts to gradually
bend the open end of the terminal lug 82 into a smooth
circular envelope around the cable 80. The three steps
of this crimping action are illustrated in FIGS. 3, 4 and
5.

Below the crimping die portion are arranged the dif-
ferent gauge size wire stripping holes 84, each hole

consisting of diametrically opposed semi-circular re-
cesses in the respective stem portions 16 and 18. These
wire stripping holes perform the standard function
whereby the wire is placed in the correspondingly sized
hole, the handles are closed and rocked back and forth
to sever the insulation, and the tool is moved longitudi-
nally along the conductor to strip off the severed por-
tion of the insulation. However, these wire stripping
holes differ from those heretofore generally used in
that the larger holes are at the upper end, closer to the
pivot 52 and the size of the holes progressively diminish
as they are further removed from the pivot. This pro-
vides the greatest mechanical advantage where the
larger holes are located and where the thicker wire with
the heavier insulation is to be worked on.

The invention claimed is:

1. A tool comprising a pair of relatively flat jaw mem-
bers pivotally connected to each other by a pivot means
intermediate their ends, said jaw members being pivot-
ally movable from an open position to a closed posi-
tion, said jaw members forming a nose portion at one
end and being integral at their opposite ends with re-
spective flat stem portions, each stem portion having a
handle portion at its free end, said jaw members having
complementary recesses at their inner edges in the nose
portion, said recesses forming ferrule crimping dies,
each jaw member having a set of linearly arranged
threaded apertures on the side of the pivot means op-
posite said ferrule crimping dies, the axes of said ap-
ertures being generally parallel to the axis of said pivot
means, each set of apertures extending diagonally rela-
tive to said pivot means, the set of apertures in one jaw
being on the opposite side of said pivot means from the
set of apertures in the other jaw, each jaw having a
shearing recess extending from the edge of the corre-
sponding jaw toward said pivot means in corresponding
position relative to the corresponding set of apertures
in the other jaw, each shearing recess being defined by
one straight edge and one shearing edge which is pro-
vided with at least one intermediate recess of a size and
configuration partially corresponding to a respective
intermediate aperture in the corresponding set of ap-
ertures in the other jaw, said edges defining an open end
of the shearing recess at the edge of the corresponding
jaw, which open end constitutes the outer end of said
shearing recess, and also defining a closed inner end of
said shearing recess, said inner end being adjacent said
pivot means and being of configuration partially corre-
sponding to the innermost aperture in the correspond-
ing set of apertures in the other jaw, each shearing edge
being movable, upon relative movement of said jaw
members, to wipe over the corresponding set of ap-
ertures in the other jaw, wire cutting means on said tool,
said wire cutting means comprising an anvil portion on
the inner edge of one stem member and a blade portion
on the inner edge of the other stem member, said anvil
portion and blade portion being in opposed relation-
ship, a terminal lug crimping means comprising op-
posed arcuate recesses on the inner edge of each stem
portion, and a linear series of wire stripping holes, each
hole being formed by complementary but opposed arc-
uate recesses on the inner edges of said stem portions.

2. The tool of claim 1 wherein a guide member is po-
sitioned on one face of one of said jaw members in the
nose portion adjacent said ferrule crimping dies, said
guide member having a stationary leg portion con-
nected to said one face and a transverse platform por-

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tion rigidly connected to and extending laterally from said one face adjacent said ferrule crimping dies, an enclosed slot between the stationary leg portion and the transverse platform portion, one edge of said slot defining a stop for a workpiece while said workpiece is held in one of the ferrule crimping dies and is supported on said platform.

3. The tool of claim 1 wherein the threaded apertures in each of said sets are progressively smaller in diameter as they are further distant from said pivot means.

4. The tool of claim 1 wherein the blade portion of said wire cutting means has outwardly-extending angu-

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lar end portions.

5. The tool of claim 1 wherein one of the arcuate recesses of the terminal lug crimping means is of a shape conforming to the peripheral shape of a wire and other arcuate recess has a predetermined cam shape constructed and arranged to bend the open portion of a terminal lug into circular envelopment of said wire.

6. The tool of claim 1 wherein said wire stripping holes are of progressively smaller diameter as they are positioned further away from said pivot means.

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