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Hoffman

[11] **3,737,840**

[45] **June 5, 1973**

[54] **LUG ASSEMBLY**

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[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

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[52] **U.S. Cl.** ..... **339/273 F,** 174/72 R

[51] **Int. Cl.** **H01r 7/06**

[58] **Field of Search** ..... 339/270, 273, 276; 174/72 R

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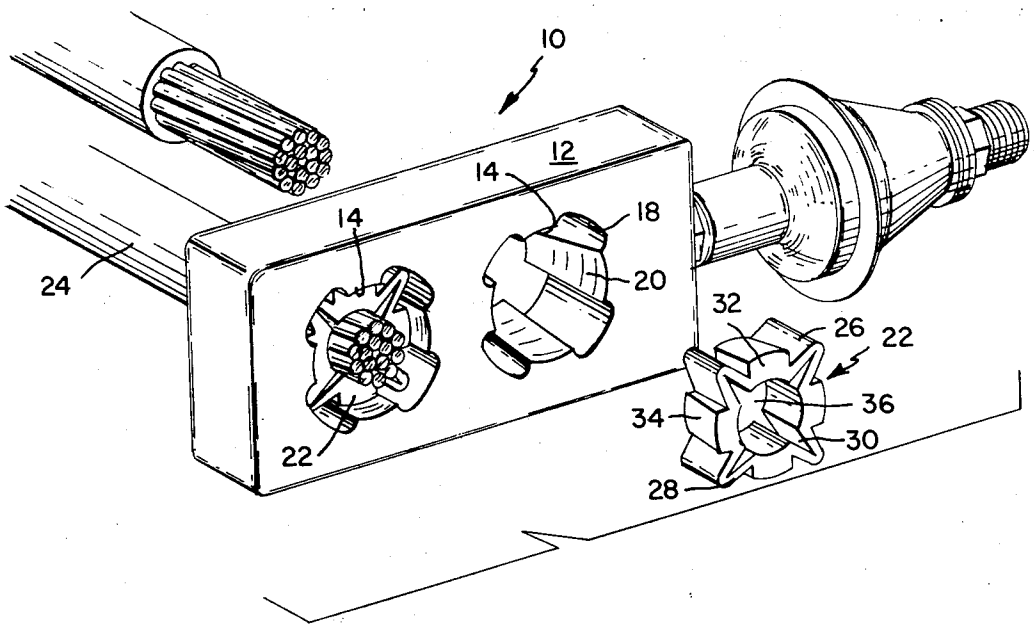
Primary Examiner—Joseph H. McGlynn

Attorney—William J. Keating, Gerald K. Kita, John K. Flanagan and Allan B. Osborne et al.

[57] **ABSTRACT**

This invention relates to a lug assembly and more particularly to a bar having one or more tapered passageways therein to receive a partly deformable connector in which is emplaced the end of a cable to be joined to the lug assembly. Further this invention relates to a tool for inserting the connector into the bar as well as for removing the same therefrom.

2 Claims, 13 Drawing Figures



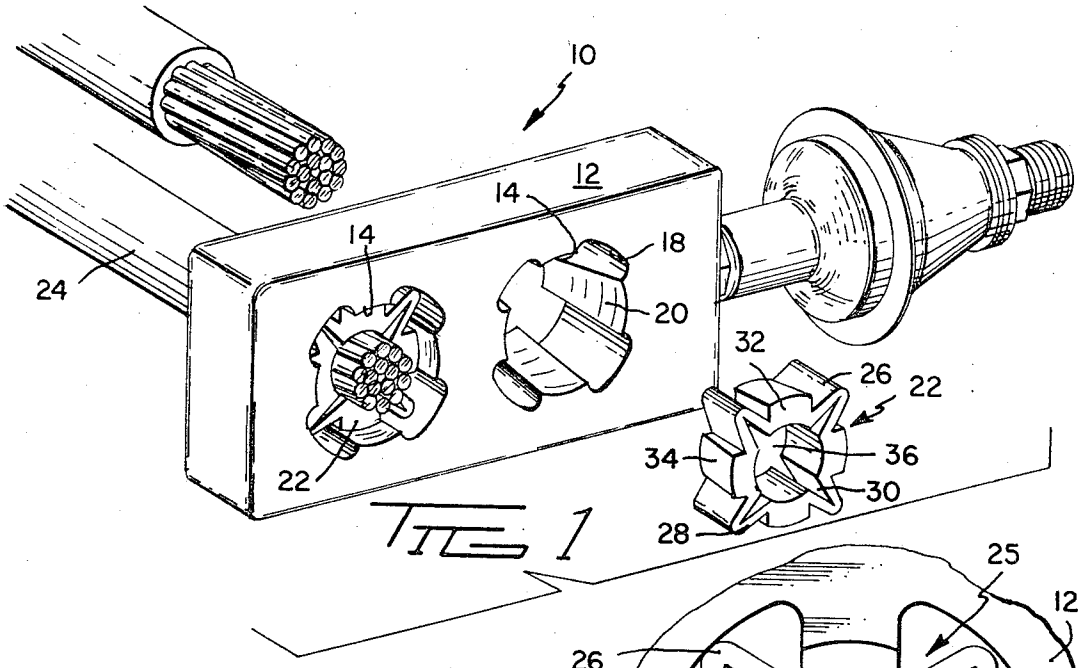


FIG 1

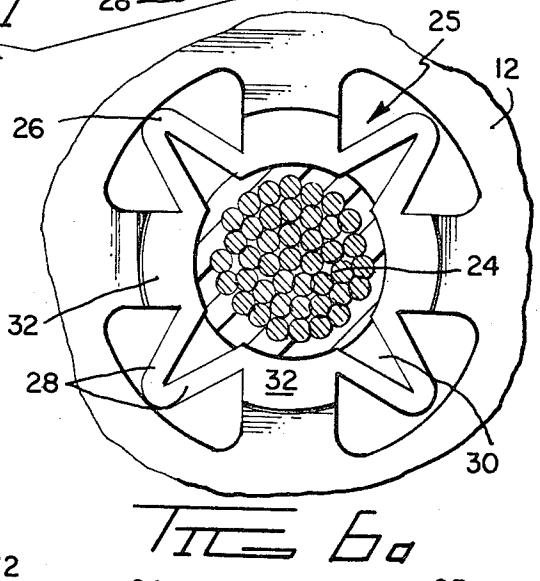
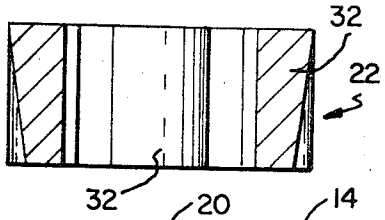


FIG 6a



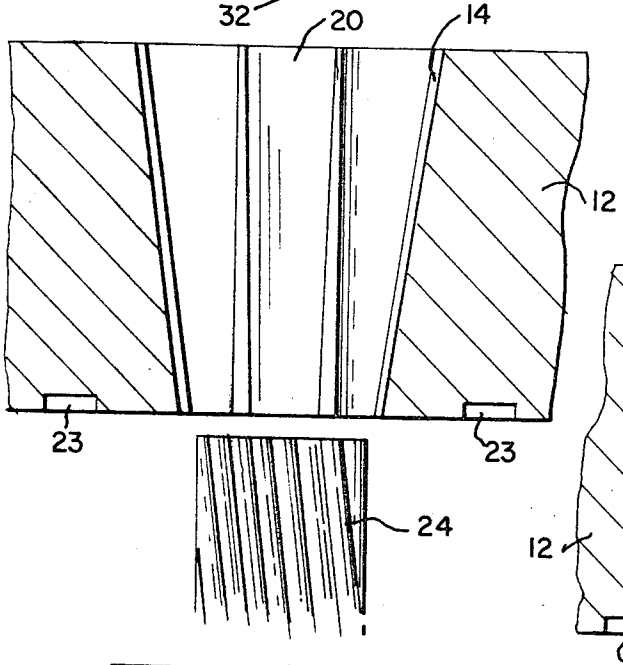


FIG 5

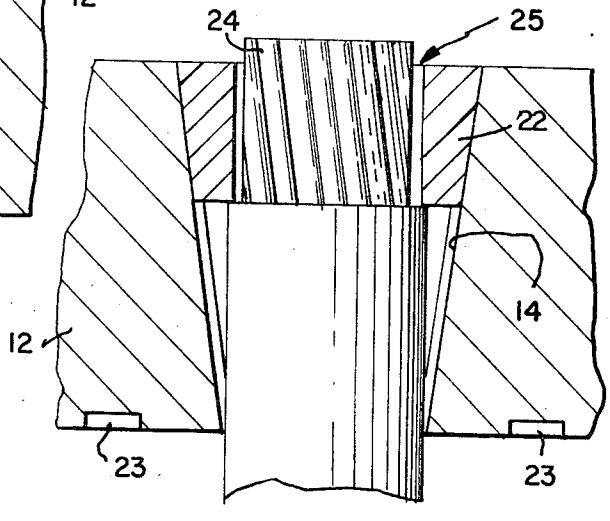


FIG 6b

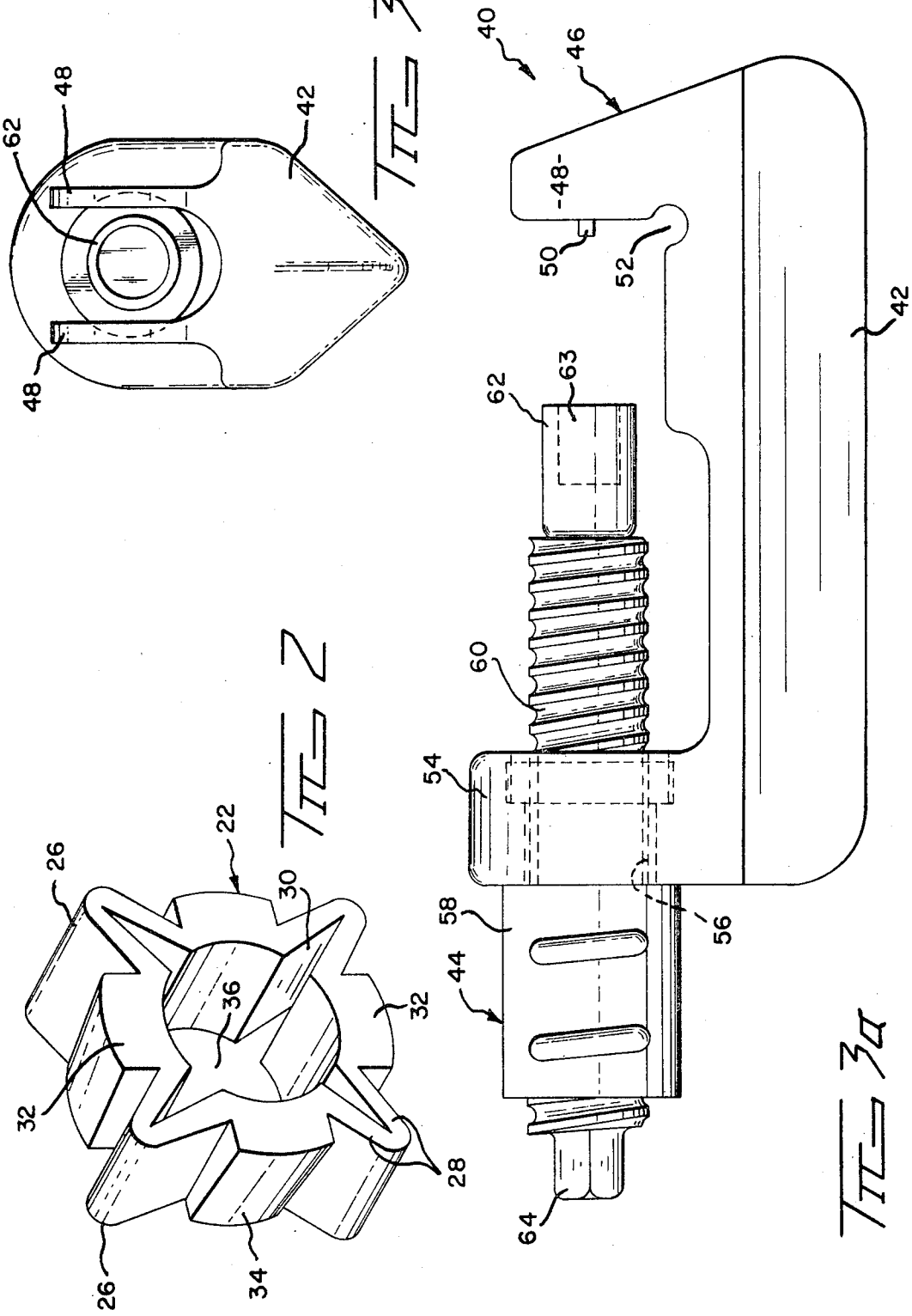


FIG 3a

FIG 3b

FIG 2

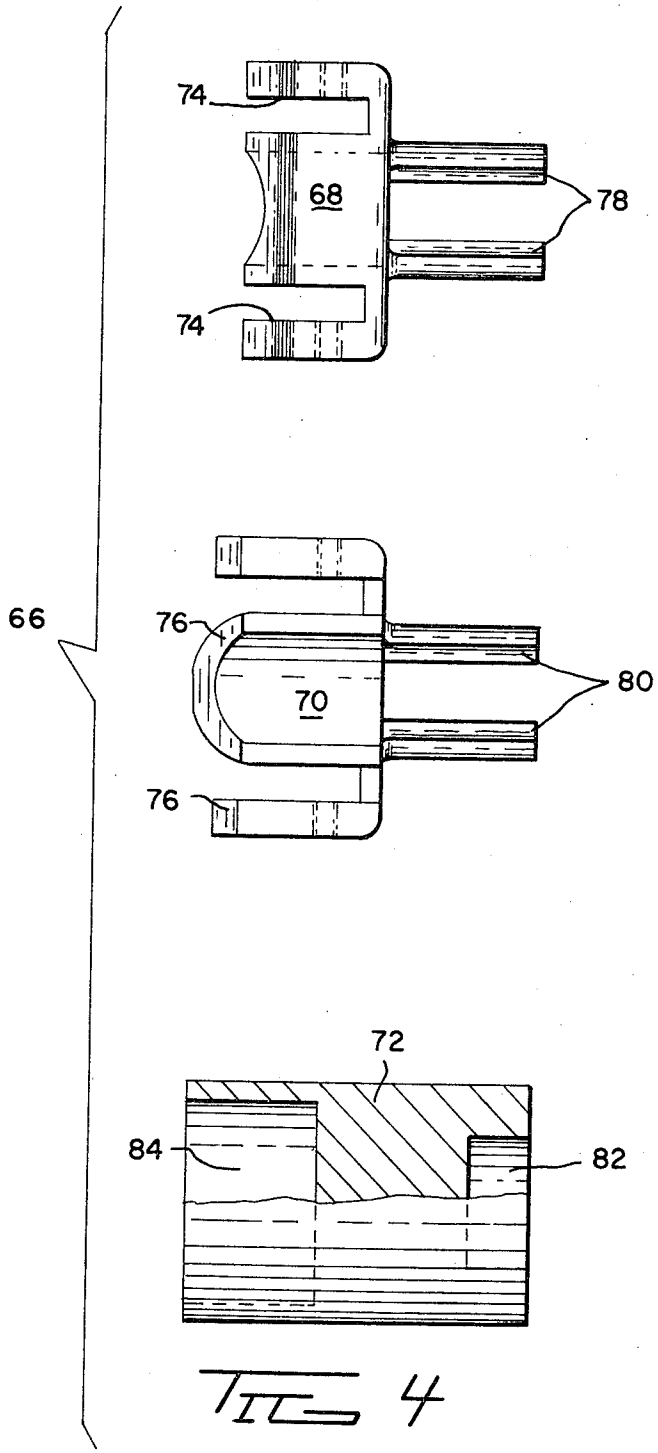
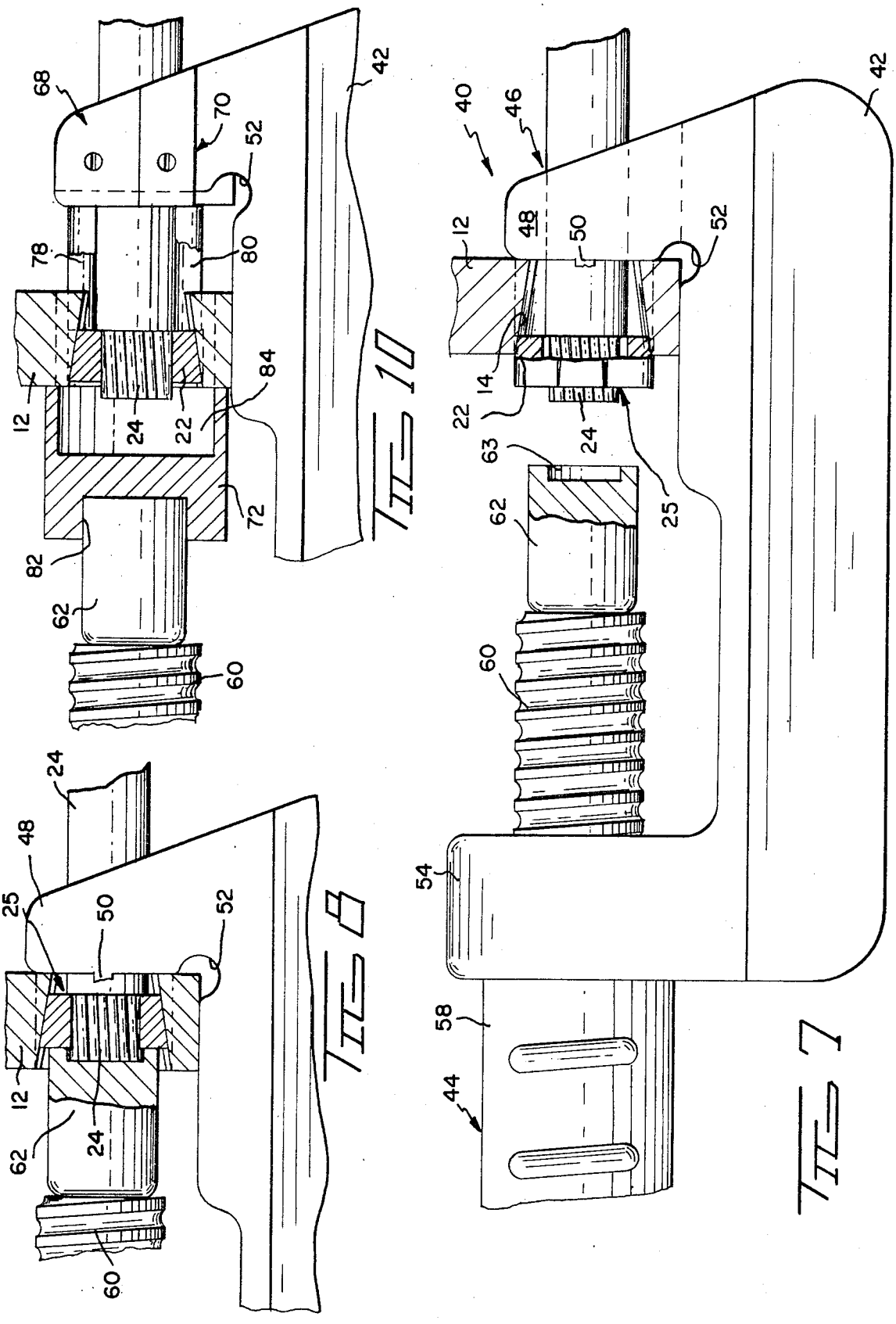


FIG 4


68
70
52
78
80
42
84
12
24
22
72
82
62
60
FIG 10
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46
42
12
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52
14
22
24
63
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62
60
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58
44
FIG 7
24
48
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50
52
12
24
62
60
FIG 8

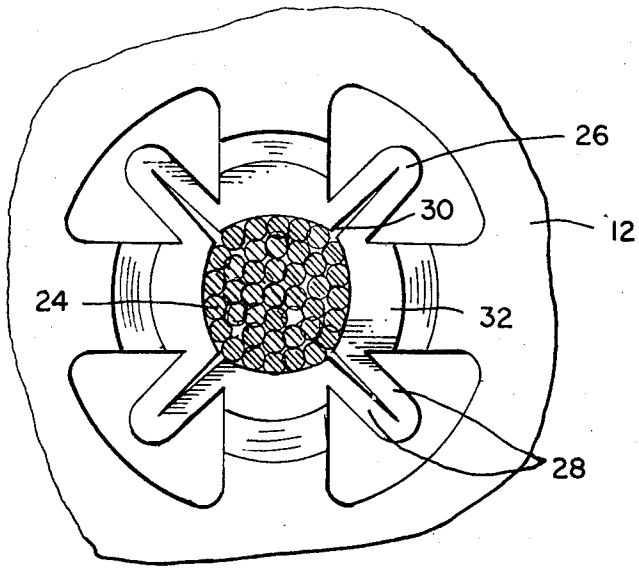


FIG 9a

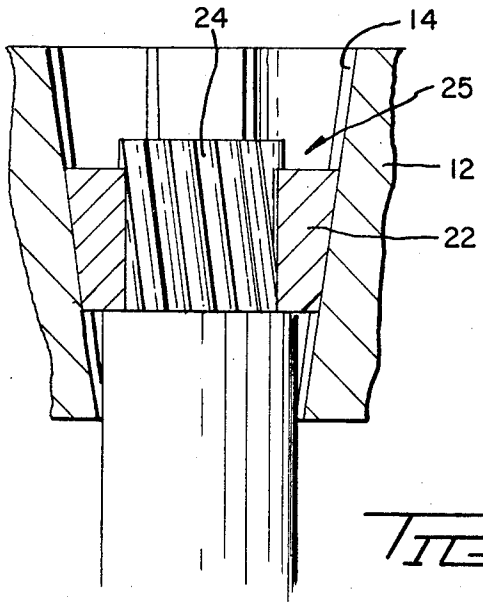


FIG 9b

LUG ASSEMBLY

BACKGROUND OF THE INVENTION

Lugs which connect one or more electrical power lines to a pad mounted transformer are well known in the art. Such lugs generally are flat aluminum plate attachable at one end to the transformer and having a number of holes on the other end to permit the attachment of a terminal thereto via bolts or the like. While such attachment is entirely satisfactory from both a mechanical and an electrical viewpoint, it does require a terminal to be first affixed to the cable by soldering, crimping or other ways. Where large numbers of cables are being so attached, the current method above described involves considerable time and expense.

Accordingly, the present invention provides a lug assembly for retaining at least one cable which comprises at least one connector which contains a bore adapted to receive a cable and a bar having at least one passageway adapted to removably receive the connector and retaining means in the passageway and on the connector cooperating to retain the cable in the connector and removably retain the connector in the passageway.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective of the preferred embodiment of the present invention;

FIG. 2 is a perspective of the connector of FIG. 1;

FIGS. 3*a*, 3*b* and 4 are sectional views of the preferred embodiment of the applicator tool used in the practice of the present invention;

FIGS. 5 thru 9*b* illustrate the assembly of the present invention; and

FIG. 10 illustrates the disassembly of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and to FIG. 1 in particular, shown therein and generally designated by the reference numeral **10** is the lug assembly constructed in accordance with the invention. The basic member of lug **10** is bar **12** which may be made of 6063 aluminum and suitably heat treated. Contained within bar **12** are two identical passageways both designated at **14.** Each passageway **14** has four inwardly facing, C-shaped grooves, collectively designated at **18,** spaced equidistant one from the other about the periphery of the passageway. The passageway itself is defined by four longitudinally tapered lands collectively designated at **20.** The taper increases toward the side of the bar away from the reader. Lands **20** are also transversely curved, each having the same degree of curvature.

Positioned in the left passageway **14** is the cable housing or connector **22** and cable **24,** the two when joined being hereinafter designated as sub-assembly **25** (see for example FIG. **6***a*). Such sub-assembly is retained in bar **12** by cooperative action of passageway **14** and connector **22** as will be discussed below.

There is provided on the right hand side of bar **12** a threaded aperture (not shown) which receives a bushing or other like connections as may be applicable.

A series of horizontal slots **23** are provided on the side of bar **12** facing away from the reader (see FIG. **5**). Slots **23** are for the purpose of aligning bar **12** with the applicator tool (FIG. 3) during assembly of lug **10.**

FIG. 2 illustrates connector **22** which may be made of 6063 aluminum and left untreated so as to be softer than bar **12** and cable **24.** The ring-shaped connector is characterized by having four outwardly projecting webs, collectively numbered **26,** each spaced 90° from another. Each web consists of two inwardly diverging legs, collectively numbered **28,** which define space **30** thereinbetween. Integral with webs **26,** and interposed thereinbetween, are four outwardly projecting jaws collectively numbered **32.** Each jaw contains an outwardly facing, tapered, curved surface **34.** Webs **26** and jaws **32** define longitudinal bore **36** extending through connector **22.**

Referring now to FIGS. 3a and 3b, shown therein and generally designated by reference numeral **40** is a preferred embodiment of the assembly tool useful for mounting sub-assembly **25** into bar **12.** Tool **40** includes a C-shaped frame **42,** a mandrel unit **44** and an engaging section **46.** Engaging section **46** consists of two parallel, spaced apart arms, both designated at **48,** and a pin **50** positioned midway up each arm and facing inwardly toward mandrel unit **44.** At the base of arms **48** a transverse cavity **52** is provided for receiving the bottom edge of bar **12** during assembly. Such cavity extends normally across frame **42.**

Mandrel unit **44** includes arm **54** having an internally threaded bore **56** which accommodates a conventional thread unit **58.** Unit **58** in turn rotatably receives mandrel **60** which contains, on its forward end, ram **62** having cavity **63** therein. Ram **62** is swively mounted to have freedom of rotational motion independent of mandrel **60.** The back end of mandrel **60** is formed into a hexagonal projection **64** to accomodate means (not shown) to rotate the mandrel.

FIG. 4 illustrates the take-off attachment **66** to tool **40.** Attachment **66** consists of top and bottom units **68** and **70** respectively and ram adapter **72.** Units **68** and **70** have slots **74** and **76** respectively on one side and fingers **78** and **80** respectively on the opposite side. Ram adapter **72** is cylindrical in shape and has recesses **82** and **84** in opposite ends thereof.

OPERATION OF THE PREFERRED EMBODIMENT

With reference to FIGS. **5** thru **9***b*, the operation of the preferred embodiment will be described; FIG. **5** showing the alignment of connector **22** and cable **24** with bar **12** prior to assembly.

Connector **22** is inserted into passageway **14** in bar **12** with each groove **18** receiving a web **26** as seen in FIG. **6***a*. The sub-assembly is hand-pressed into passageway **14** until interference between tapered lands **20** and tapered surfaces **34** on jaws **32** prevents further such insertion.

Assembly tool **40** is now positioned on bar **12** as seen in FIG. **7.** Pins **50** engage the slots thereon so as to align ram **62** on mandrel **60** with connector **22** in bar **12.** The aforementioned groove **52** accommodates the edge of bar **12** so as to prevent interference in positioning the bar against arms **48** and frame **42** and also to prevent a source of stress concentration which is present whenever a sharp corner engages a solid surface. Cable **24** is passed thru passageway **14** and thru bore **36** of connector **22** to form aforementioned subassembly **25.** As is shown in the drawings and as is well known in the art, that part of cable **24** which engages connector **22** has its insulation removed where, as shown here, an electrical as well as a mechanical attachment is to be made.

The relationship between connector 22 and cable 24 at this point is shown in FIG. 6*a*. Note that cable 24 does not necessarily engage the walls of bore 36.

That portion of cable 24 projecting beyond connector 22 is received within cavity 63 in ram 62 so as to permit flush engagement of the ram with the face of the jaws of the connector. Mandrel 60 is then rotated, driving subassembly 25 deeper into passageway 14 as shown in FIGS. 8 and 9*b*. As the diameter of lands 20 within passageway 14 decrease due to the taper thereon, jaws 32 are forced radially inwardly. As the jaws are forced inwardly, the integrity of connector 22 is preserved by legs 28 of webs 26 drawing in toward each other. This novel feature can be seen by comparing FIGS. 6*a* and 9*a*. Note in FIG. 9*a* that jaws 32 have been squeezed onto cable 24 and that legs 28 have been drawn together as a result of the jaws being forced inwardly. As the connector is softer than either the bar or cable, it is compressed tightly against the entire circumference of the cable and also against the tapered surface of lands 20 without deforming or damaging either the cable or bar.

Removing sub-assembly 25 from bar 12 is as uncomplicated as the assembly described above. The bottom unit 70 of take-off attachment 66 is installed on engaging section 46 by sliding the unit onto arms 48 via slots 76 so that fingers 80 project toward ram adapter 72 which had been placed onto ram 62 via recess 82. Bar 12 is then placed onto frame 42 so that fingers 80 abutt the two lower webs 26 on connector 22. The top unit 68 of take-off attachment 66 is next emplaced on section 46 over bottom unit 70 with cable 24 thereinbetween. Fingers 78 abutt the two upper webs 26 on connector 22. FIG. 10 shows the completed assembly for removing sub-assembly 25 from the bar 12. Note that the portion of adapter 72 defining recess 84 abutt against bar 12 and that recess 84 is aligned with passageway 14.

By rotating mandrel 60, bar 12 is driven toward arms 48 on frame 42. Connector 22, abutting fingers 78 and 80, is forced back out of passageway 14.

If sub-assembly 25 is to be replaced into bar 12, the procedure described above is repeated. In this case sub-assembly 25 will be driven a little deeper into passageway 14 due to the previous crimping of jaws 32 on connector 22.

If sub-assembly 25 is to be disassembled, it will be necessary to cut or pry connector 22 off cable 24 because of its grip on the cable.

In addition to the novel and advantageous features described above and apparent from the drawings in conjunction with such description, a lug assembly of a given dimension, constructed in accordance with the present invention, is capable of connecting a wide range of cable sizes. For example, one prototype so constructed successfully connected electric power lines ranging in size from 1/0 to 4/0. Further, this range can be extended by changing either the depth of passageways 14, the taper of lands 20, the bore 36 in connector 22 or a combination thereof.

Yet another feature of the present invention is the economical method of producing connector 22. A continuous ingot is forced thru a form-imparting die and thereafter cut to a desired length. The jaws on the connector are then impacted to form the tapered and curved surface. During this latter process, the surface area of each jaw is increased which increases conductivity between the connector and bar 12.

One type of aluminum alloy has been mentioned as a suitable material to use in fabricating lug 10. As is well known in the art, other materials may be used. For example, a die casting alloy such as 360 aluminum has been found to be suitable.

The present invention has been described as such relates to connecting power lines to the secondary side of a pad mounted transformer. However, such description should not be considered as limiting the invention thereto. As the advantages of this invention become known, other and different uses will become evident. For example, the present invention will be useful wherever it is desirable to securely fasten wire rope or cable to a structure. Not only is a minimum amount of preparation required, but equipment such as U-bolts, hooks and the like are unnecessary.

It is intended that the particular embodiment of the invention shown and described herein is merely illustrative and the spirit and scope of the invention is limited only by the appended claims.

What is claimed is:

1. A lug assembly for retaining a cable which comprises:

a connector having two deformable webs and two jaws having tapered surfaces, each of said jaws positioned between and integrally attached to said webs, said webs and said jaws defining a bore adapted to receive said cable; and a bar having a passageway, said passageway being defined by two grooves and two lands having tapered surfaces, each of said lands positioned between said two grooves, said passageway adapted to removably receive said cable-bearing connector, said grooves receiving said webs and said lands receiving said jaws and causing said jaws to be depressed radially inwardly.

2. The connector of claim 1 wherein each of said at least two webs include two outwardly converging legs, each leg attached to a side of said jaw and being joined at a point removed therefrom.

* * * * *