April 27, 1965 H. F. WATERS 3,181,110

SOLDERLESS ELECTRIC CONNECTOR

Filed July 24, 1961 4 Sheets-Sheet 1

Fig. 1

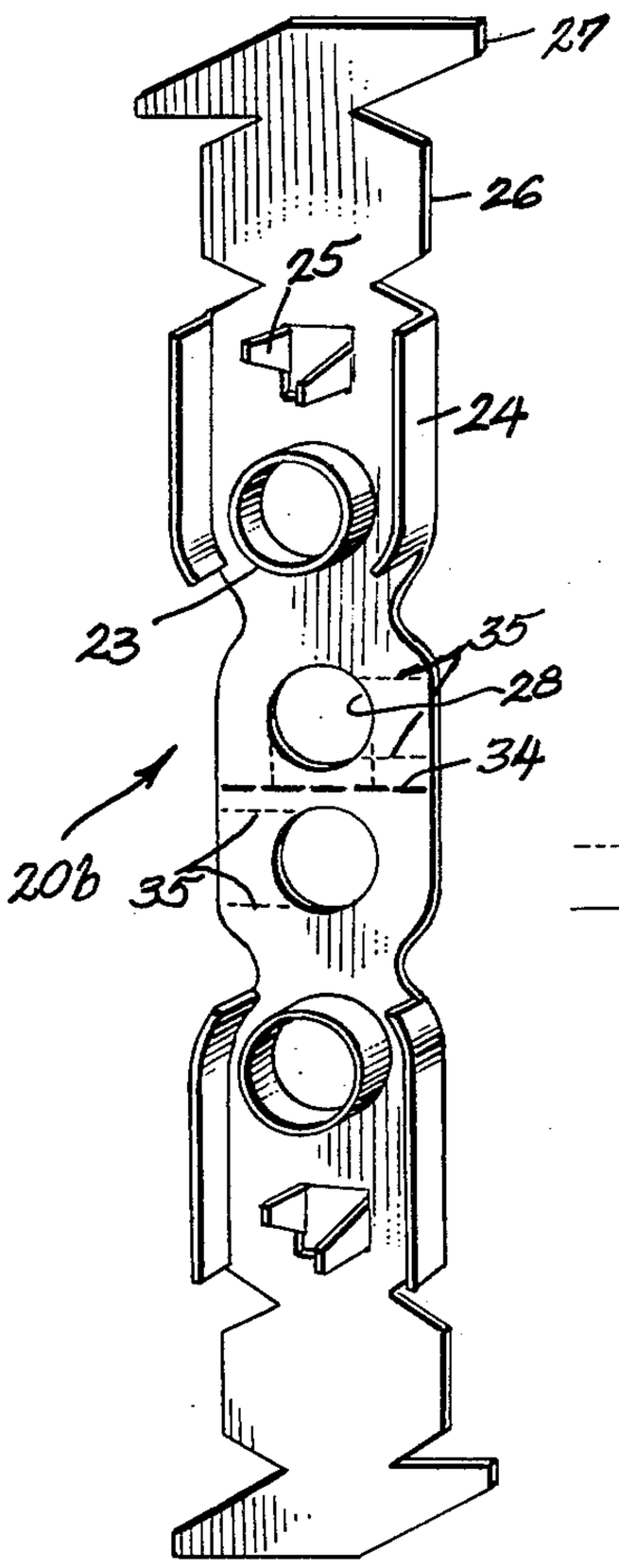
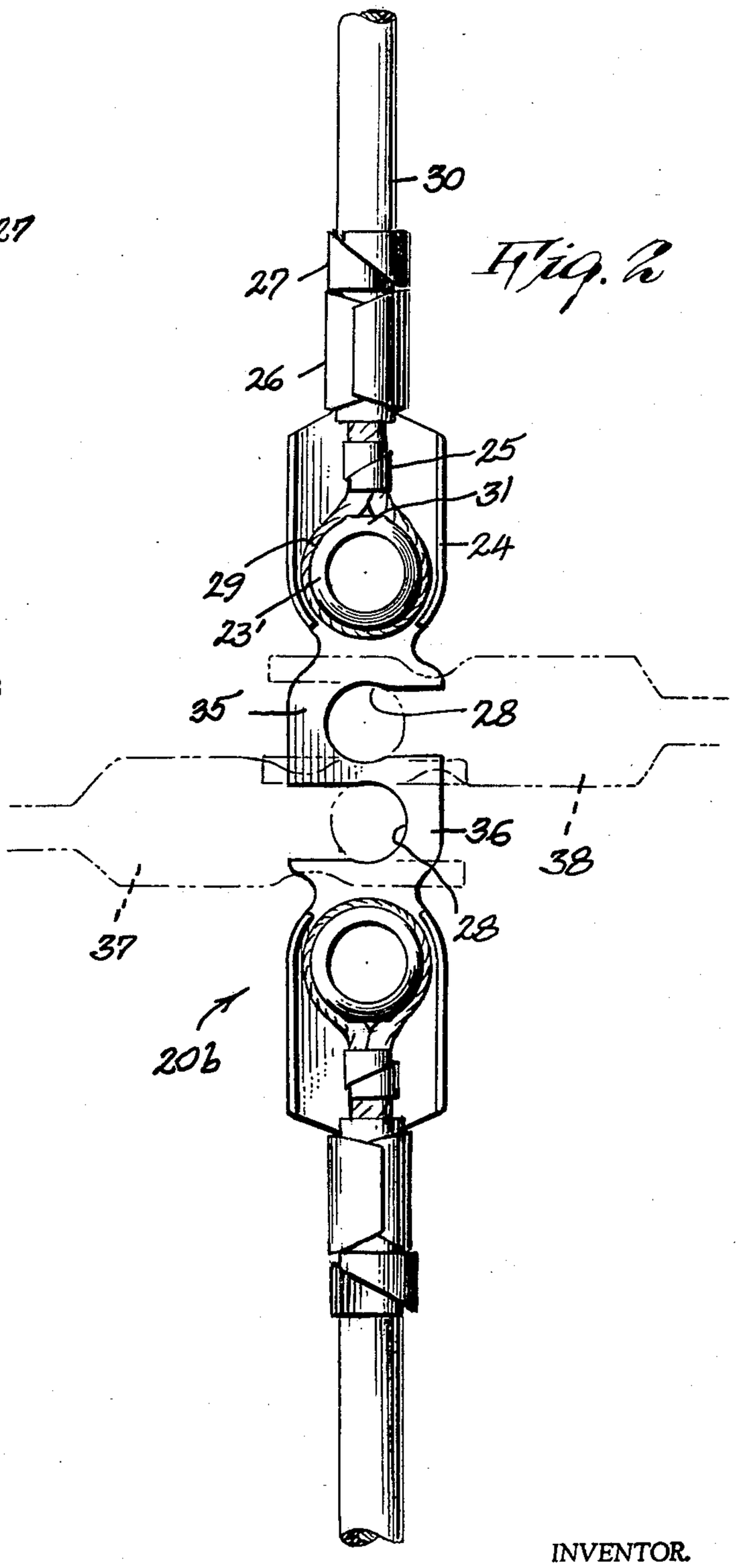


Fig. 2



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SOLDERLESS ELECTRIC CONNECTOR

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Fig. 3

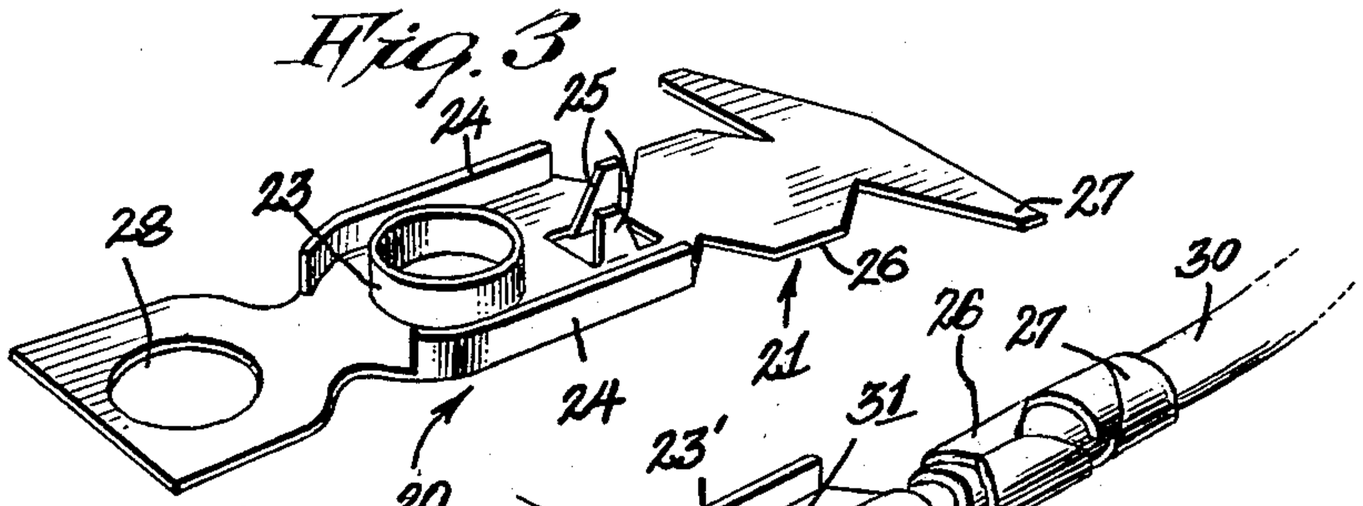


Fig. 4

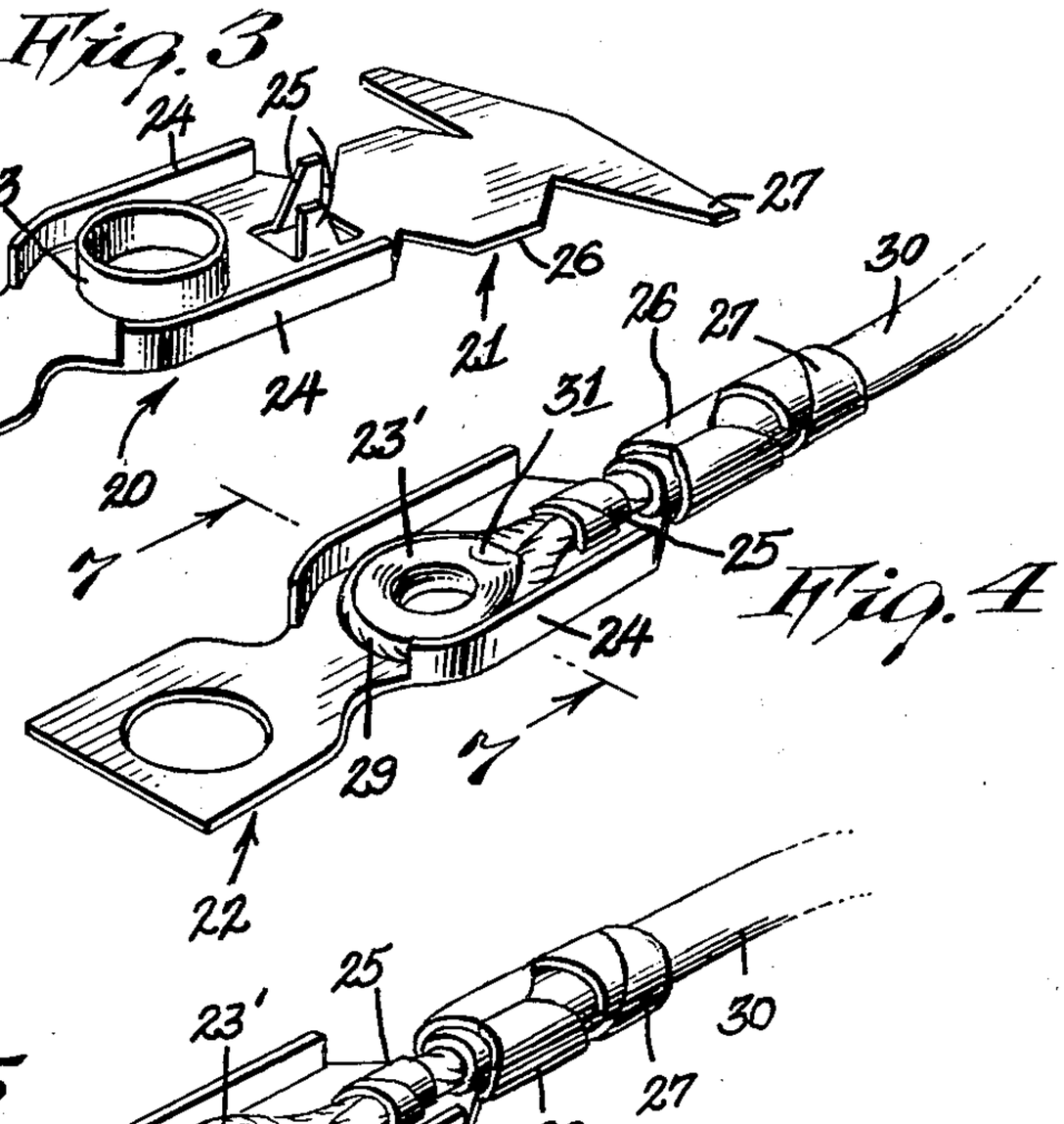


Fig. 5

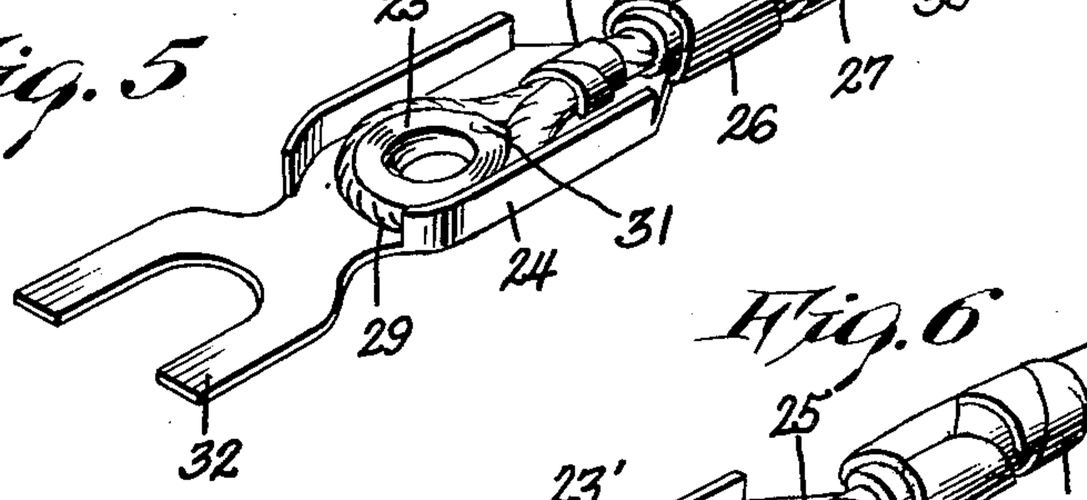


Fig. 6

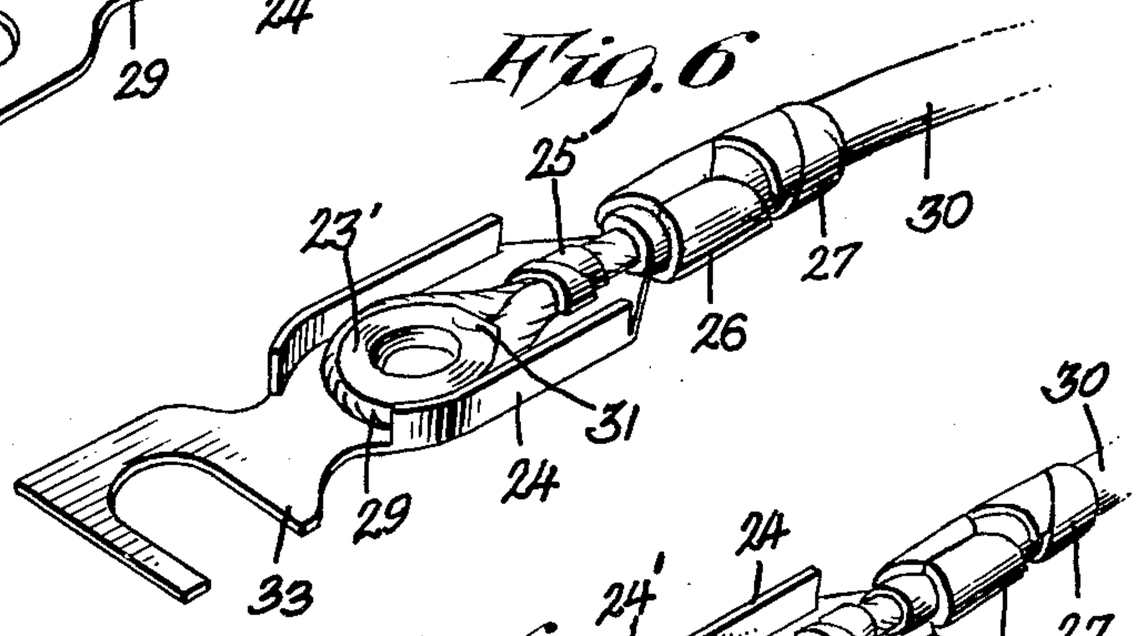


Fig. 7

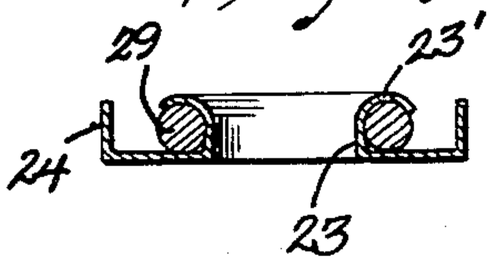
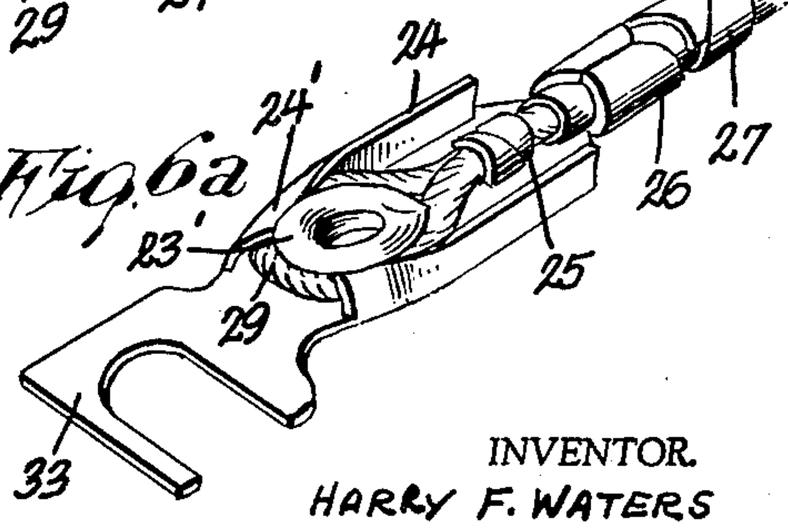


Fig. 6a



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SOLDERLESS ELECTRIC CONNECTOR

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Fig. 8

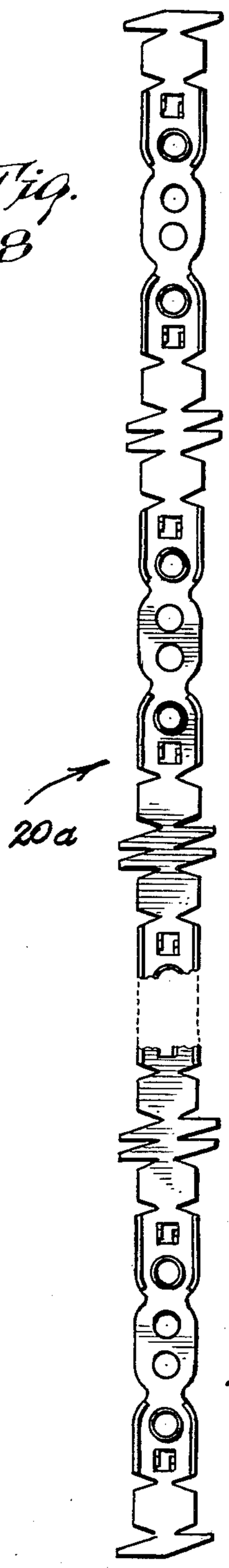


Fig. 9

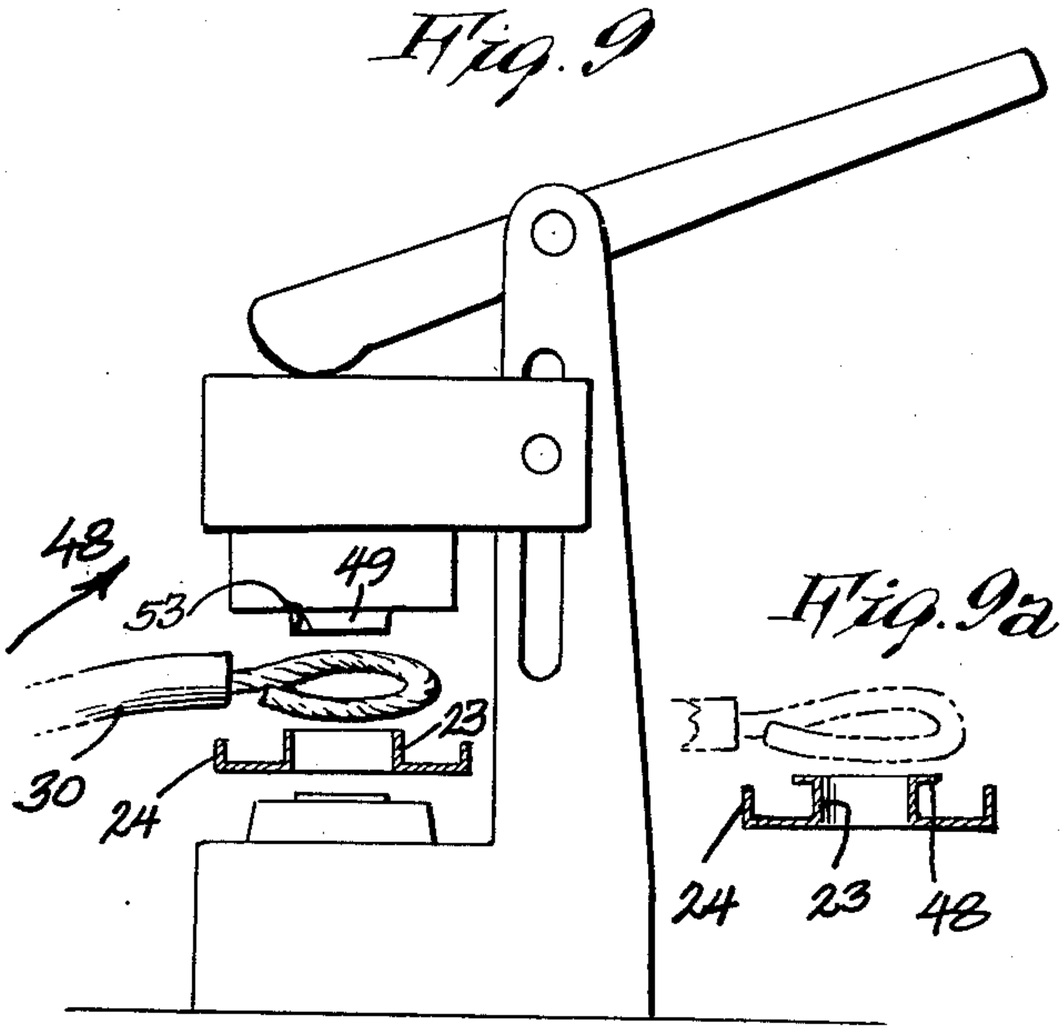


Fig. 9a

Fig. 10

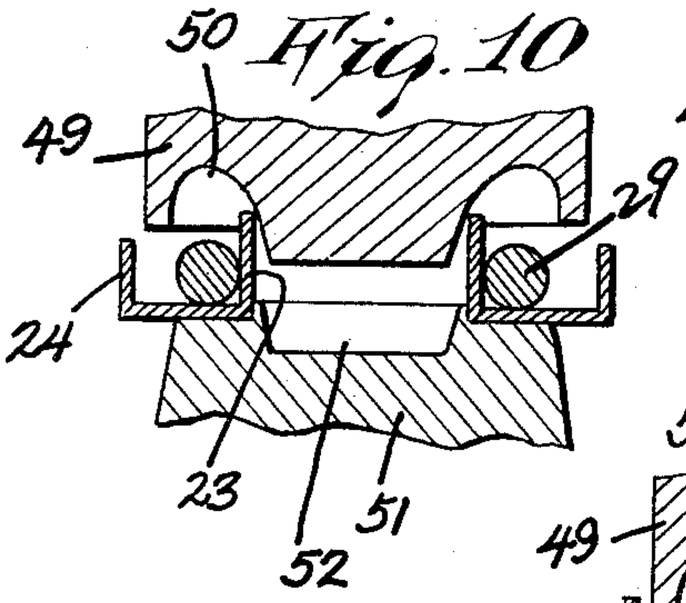


Fig. 12a

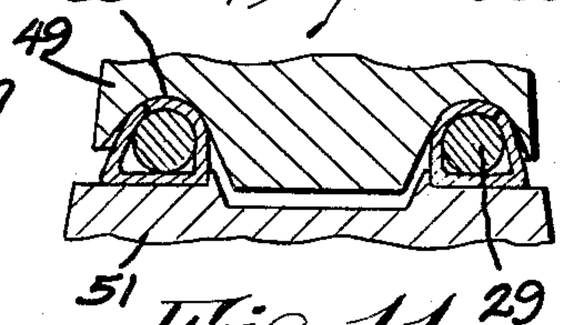


Fig. 11

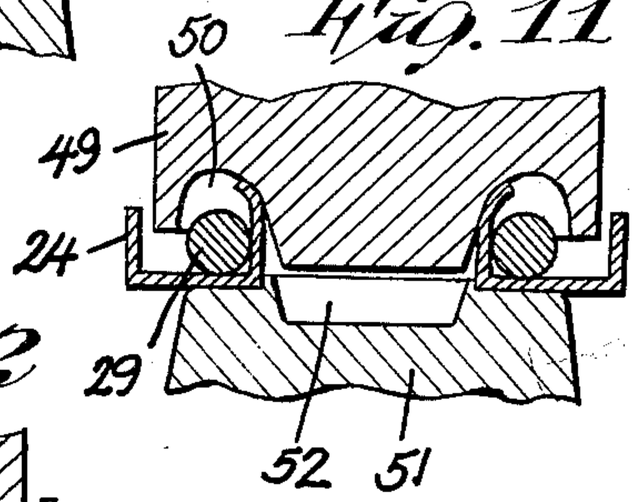
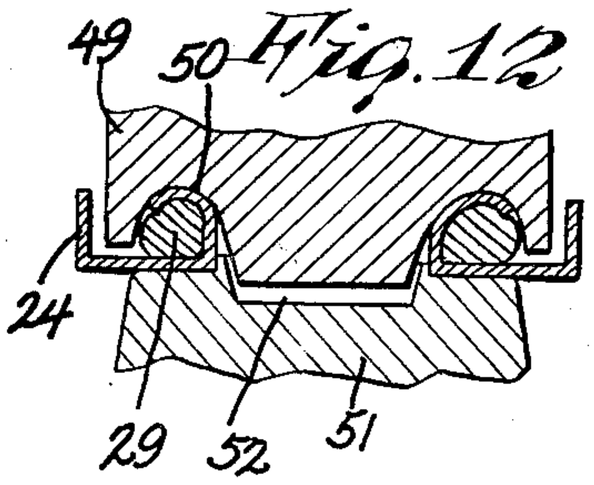


Fig. 12



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SOLDERLESS ELECTRIC CONNECTOR

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Fig. 21

Fig. 13

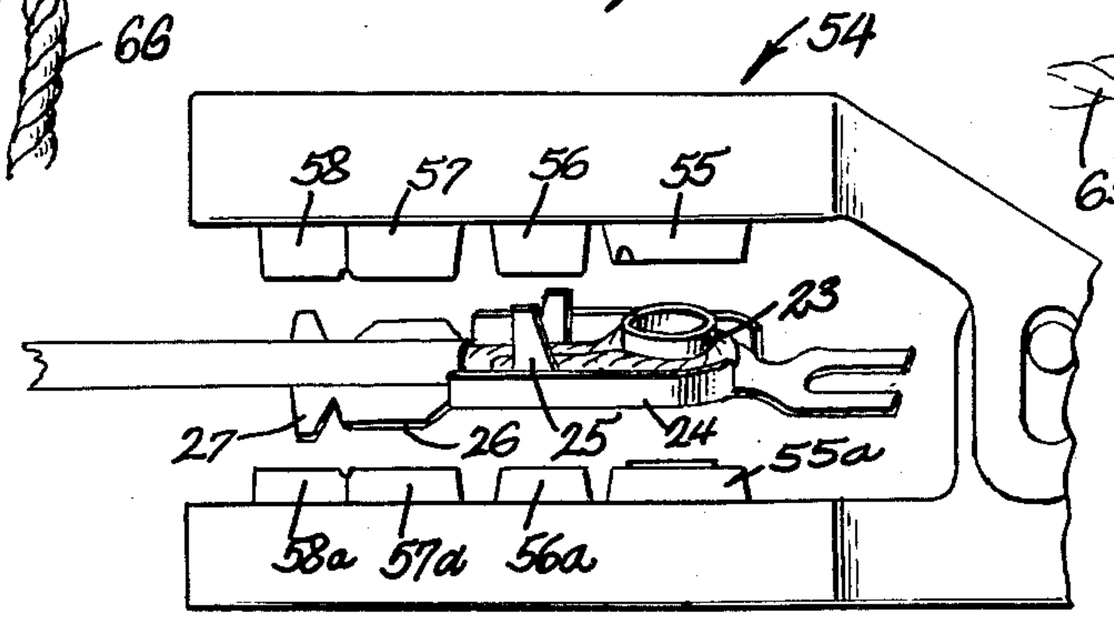


Fig. 19

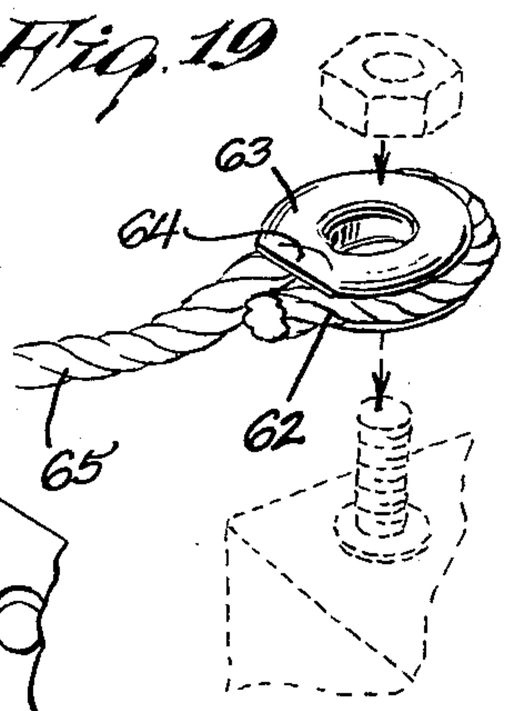


Fig. 20

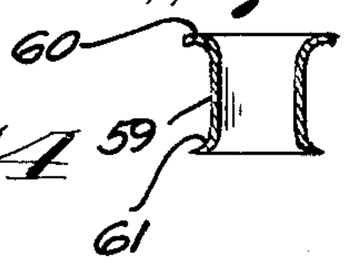


Fig. 14

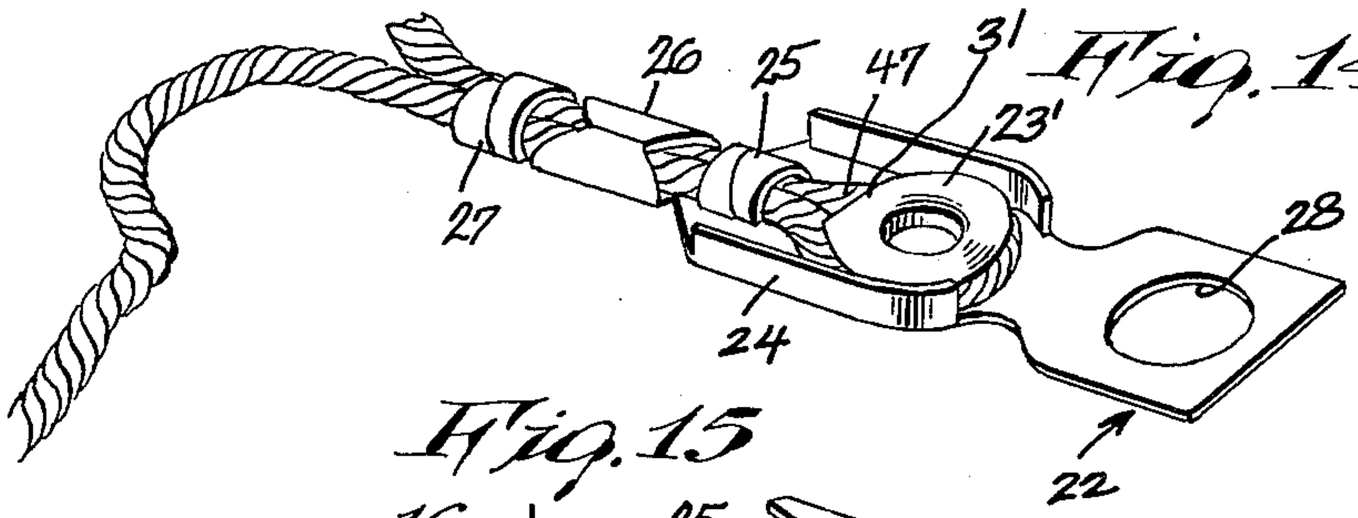


Fig. 15

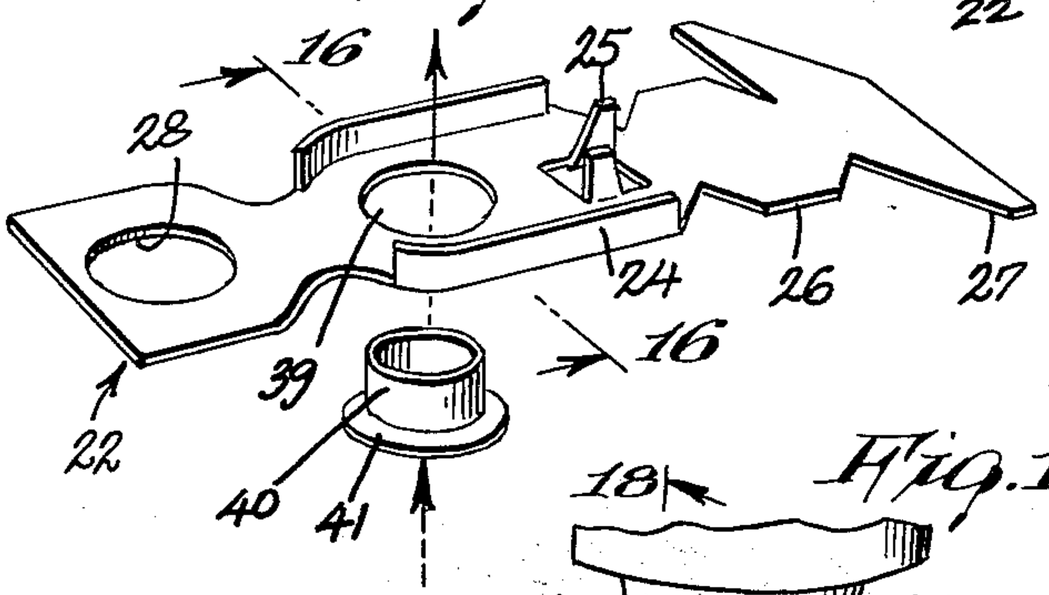


Fig. 16

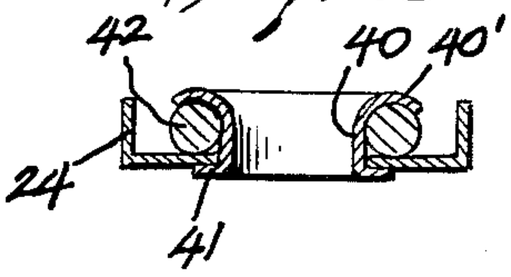


Fig. 17

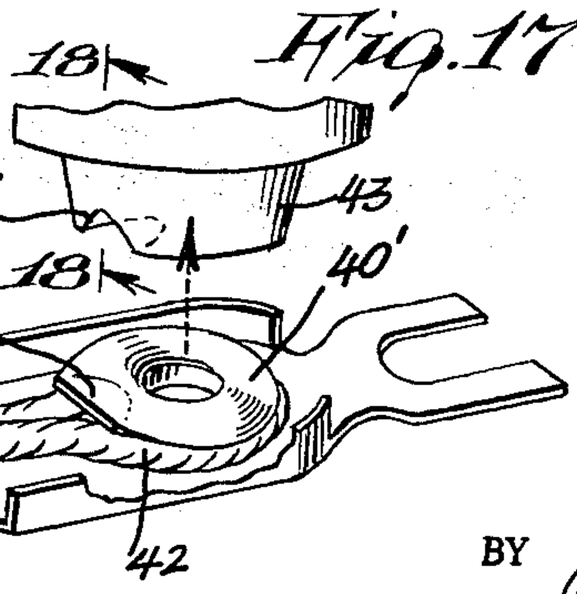
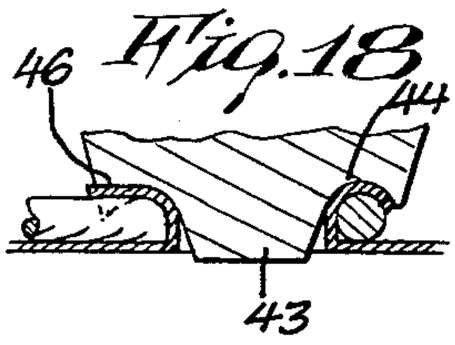


Fig. 18



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United States Patent Office

3,181,110

Patented Apr. 27, 1965

3,181,110
SOLDERLESS ELECTRIC CONNECTOR

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Filed July 24, 1961, Ser. No. 126,257
3 Claims. (Cl. 339—223)

This invention relates to solderless connectors for use on wire and similar materials and to the methods of making same and dies used therefor.

An object of the invention is to provide an efficient, cheap and simply formed connector for electrical use utilizing a looped end of a wire. To effectuate this object, applicant has utilized the interrelation between a looped end of wire and a crimped metal ring sheath for clamping force engagement to bind the looped end, to maintain electrical characteristics of the wire at the bound looped end, to increase the mechanical strength thereof inclusive of tensile strength and to insure against relative movement between the loop and the sheath.

A further object of the invention is to provide a connector utilizing the interrelationship between a wire loop and a crimped metallic sheath as set forth wherein the sheath forms a part of a metal strip terminal, the latter serving to maintain alignment and rigidity of the wire adjacent the looped end region.

A further object of the invention is to provide a method of forming an end connector including utilization of a hallow metallic post in association with an end wire loop for loop binding, at least maintenance of electrical characteristics of the wire at the looped end and to increase the mechanical strength thereat including tensile strength.

Another object of the invention is to provide a method for forming connector products as mentioned utilizing a system of reducing clamping force engagement of the post at the junction of the looped end and the adjacent wire area for wire entry into the sheath.

A further object of the invention is to provide die structures to effectuate results obtained as set forth above.

These objects and other incidental ends and advantages of the invention will hereinafter appear in the progress of the disclosure and as pointed out in the appended claims.

Attached are drawings showing several preferred forms of the invention wherein:

FIGURE 1 is a view in perspective of a twin type of connector strip formed from metal stock and having a hollow post formation part, a shank part and a connector part;

FIGURE 2 is a view in perspective of the device shown in FIGURE 1 wherein the parts are crimped and wrapped about wires at insulated and insulation-stripped parts;

FIGURE 3 is a view in perspective of a single connector blank off a connector strip;

FIGURE 4 is a view in perspective of the blank of FIGURE 3 crimped and wrapped about a wire at insulated and insulation-stripped parts;

FIGURES 5, 6 and 6*a* are views in perspective similar to FIGURE 4 showing different formations of end connector parts;

FIGURE 7 is a sectional view of FIGURE 4 across the plane 7—7 thereof;

FIGURE 8 is a plan view of an elongated connector strip and having similar structure as the twin strip shown in FIGURE 1;

FIGURE 9 is a side view in elevation showing a press for crimping the hollow post formation in the connector blank about a wire end loop for sheath production;

FIGURE 9*a* is a view in section showing the blank and hollow post formation provided with an upper edge

flange to maintain connection between the loop and post before the crimping operation;

FIGURE 10 is a sectional view showing die pieces of a press for the blank and hollow post formation for forming a metallic sheath around a wire loop;

FIGURES 11 and 12 are views similar to FIGURE 10 showing advanced stages of press operation;

FIGURE 12*a* is a sectional view showing the upper die piece of the press of FIGURE 10 modified;

FIGURE 13 is a view in perspective of a multiple press operative on a connector blank for post crimping about an insulation-stripped end loop and wrapping of ears about other wire portions;

FIGURE 14 is a view in perspective of a connector blank showing the device in operative position on the looped end of a cord or rope;

FIGURE 15 is a view in perspective of a modified form of connector blank wherein an independent hollow element is introduceable in an opening therein for crimping around a looped end of wire or cord;

FIGURE 16 is a sectional view of FIGURE 15 across the plane 16—16 thereof showing the hollow element crimped around a looped end and secured to the wall of the blank;

FIGURE 17 is an exploded view in perspective showing the hollow formation of a blank crimped over a wire end and the crimping die piece provided with a notch leading into the forming groove to limit crimping pressure at the area of junction between the wire loop end and the entering wire region;

FIGURE 18 is a sectional view of FIGURE 17 across the plane 18—18 thereof;

FIGURE 19 is a view in perspective showing a wire end loop and a metallic sheath formed therearound with crimping pressure reduced at the wire entry region and for application to a post terminal;

FIGURE 20 is a sectional view of a hollow post in spool conformation to engage a wire end loop between the flanges prior to the crimping operation to effect the product shown in FIGURE 19;

FIGURE 21 is a view in perspective showing the product of FIGURE 19 applied to a cord or rope loop.

In accordance with the invention and the several forms shown, a metallic connector blank generally indicated by numeral **20** as seen in FIGURE 3 is a unit having a shank end generally indicated by **21** and a lug or connector end generally indicated by **22**. Intermediate the ends **21** and **22** is a hollow upstanding conformation **23**, upstanding longitudinal edge wall portions **24** and upstanding wrapping ears **25**. The shank **21** is provided with bendable and opposing wrapping ears **26** and **27**. The lug end **22** has an opening **28** for connection to a second conductor.

As seen in FIGURE 4, post **23** is adapted to form a sheath **23′** about bare wire end loop **29** by a crimping operation, while ears **25** are wrapped around the bare wire adjacent area and ears **26** and **27** are wrapped around the insulation **30** of the wire. An area **31** of the sheath **23′** is offset for reduced clamping engagement to admit entry of the wire within the sheath.

FIGURES 5 and 6 show different types of connector ends from **22** seen in FIGURES 3 and 4; such as axially aligned **U** shaped connector **32**, offset **U** shaped connectors **33**.

FIGURE 6*a* shows a modification of edge walls **24** at **24′** wherein parts overlap loop **29** and approach sheath **23′** for reinforcement.

The blank **20** shown in FIGURE 3 may come from a strip **20***a* shown in FIGURE 8 and formed from metal stock. As shown in FIGURE 1, the twin blank **20***b* derivative from **20***a* shows separation mark **34** for division or cutting between the lug or connector end portions,

while score lines 35 indicate various means of modifying the connector ends as seen in FIGURES 3, 4, 5, 6 and 6*a* at parts 22, 32 and 33.

FIGURE 2 shows the blank 20*b* operative as a connector for a break in any line and operative upon the line ends, the connector ends being cut formed as at 25 for lateral blank connections 37 and 38 shown in phantom.

As shown in FIGURE 15, a substitute is made for the blank hollow formation 23 by introducing into blank opening 39 a hollow post or rivet 40 with a bottom flange 41 and effecting crimping thereof around a wire loop 42 as seen in FIGURE 16. This is accomplished by the die shown in FIGURES 17 and 18 which has a tapered element 43 and a peripheral crimping groove 44, said groove having an entry notch 45 to effect a reduced crimped area 46 in the sheath 40' for wire entry.

FIGURE 14 shows the blank applicable to a cord or rope loop 47.

FIGURE 9*a* shows a modification of blank hollow conformation 23 by having a top flange 48 so that the loop 29 shown in phantom may not slip through prior to the crimping operation.

Crimping for the blank hollow conformation 23 about the wire loop may be done by ordinary pliers or an eyelet type of hand or power press machine modified by the notch 45 as described with respect to FIGURE 17. Thus the press indicated by numeral 48 has a die piece 49 having a peripheral groove 50 to crimp the upper end of hollow post formation 23 around the loop 29 as seen in FIGURE 10, a bottom die with a socket 52 being shown. A notch entering groove 50 is shown in FIGURE 9 to relieve crimping pressure as heretofore mentioned. FIGURES 11 and 12 show successive stages of die operation shown in FIGURE 10.

FIGURE 12*a* shows a modified groove in die piece 49 whereby the blank longitudinal walls 24 are also crimped about the loop 29 to form a continuous sheath.

FIGURE 13 shows a multiple press 54 for simultaneous operation of a crimping operation and wrapping of the blank ears 25, 26 and 27. The dies are diagrammatically indicated by 55–55*a*, 56–56*a*, 57–57*a* and 58–58*a*.

In FIGURE 20 is shown a hollow metallic post 59 for use solely as a binding for a wire or cord loop and as a sheath in clamping engagement. The post 59 is preferably provided with upper and lower flanges 60 and 61 to trap the loop as 62 in FIGURE 19 and thereafter the post ends are crimped as at 63 around the looped end. Thus a new type of wire 65 is provided with an eyelet end afforded by a metallic sheath. A reduced clamping area 64 is provided for the reasons mentioned.

In FIGURE 21 is shown a cord or rope 66 with an eyelet end with same features as shown in FIGURE 19 and indicated by primed numerals.

It is distinctly understood that minor changes and variations in the structure of the product, the methods and apparatus used in formation may all be resorted to without departing from the spirit of the invention and the scope of the claims.

I claim:

1. A connector for a length of insulated wire comprising, a wire formed at one end with a non-insulated loop, the connector consisting of a metallic strip formed at one end with a connecting lug for attaching it to a point of electrical contact, the opposite end of the strip having a pair of laterally directed wings for extension about an insulated portion of the wire, a hollow post extending from the strip between the connecting lug and the wings, said post being encircled by the non-insulated loop and having an overturned flange behind which the loop is confined, a pair of prongs struck from the body of the strip and located between the post and the wings, said prongs being extended around the non-insulated part of the wire and securing the junction ends of the non-insulated loop, and side flanges extending along the opposite sides of the strip, said flanges being located to the rear of the connecting lug.

2. A connector as provided for in claim 1, wherein the side flanges are curved inwardly at one end toward the post and wherein the prongs are located between said flanges and are spaced therefrom.

3. A connector as provided for in claim 2, wherein the flanges are bent inwardly at their curved ends so that the inwardly-bent portions of said flanges overlie parts of the non-insulated loop.

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