Sept. 2, 1947. F. G. KRUEGER 2,426,831

SOLDERLESS TERMINAL LUG FOR ELECTRICAL CONDUCTORS

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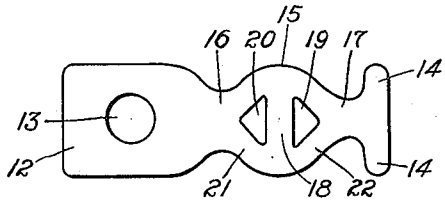


Fig. 1.

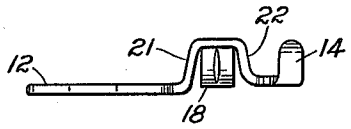


Fig. 3.

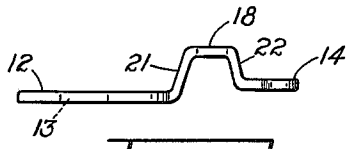


Fig. 2.

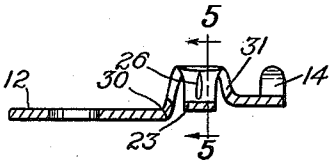


Fig. 4.

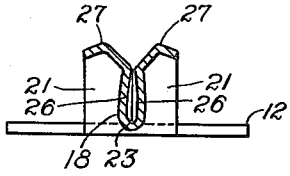


Fig. 6.

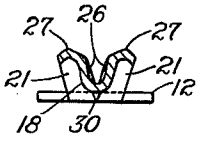


Fig. 5.

Fig. 7.

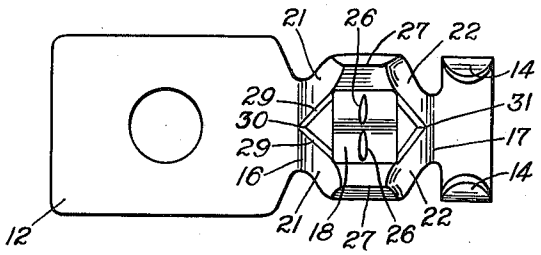
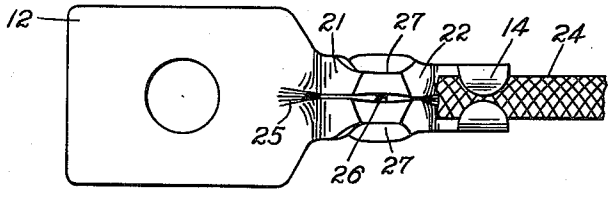


Fig. 8.



INVENTOR,
FRED G. KRUEGER
BY
Zugelter & Zugelter
Atty's.

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SOLDERLESS TERMINAL LUG FOR ELECTRICAL CONDUCTORS

Fred G. Krueger, Norwood, Ohio

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5 Claims. (Cl. 173—269)

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This invention relates to solderless terminal lug for establishing electrical connections.

An object of the invention is to provide a solderless terminal lug of improved construction, such that its gripping power upon a conductor is greatly enhanced.

Another object is to enhance the gripping power of a lug of the character stated, without resort to special tools in the application of the lug to a conductor, and without materially increasing the manufacturing cost of the terminal lug.

Another object is to so construct a terminal lug that its gripping power is of a high order or value, notwithstanding the use of copper or other comparatively soft material in the fabrication of the lug.

The foregoing and other objects are attained by the means described herein and illustrated in the accompanying drawing, in which:

Fig. 1 is a plan view of a flat blank from which the improved terminal lug is formed.

Fig. 2 is a side elevational view showing the blank partly formed as the result of an initial bending operation.

Fig. 3 is a view similar to Fig. 2, showing the lug in completed form as the result of a subsequent bending operation.

Fig. 4 is a longitudinal vertical cross-section of the lug shown in Fig. 3.

Fig. 5 is a transverse cross-sectional view taken on line 5—5 of Fig. 4, showing the relationship of elements as they appear before the lug is deformed in applying it to a conductor.

Fig. 6 is a view similar to Fig. 5, but on a larger scale, showing the lug after it has been deformed in the manner intended incident to application thereof to a conductor.

Fig. 7 is a plan view of the improved terminal lug as produced for distribution.

Fig. 8 is a plan view showing the lug of Fig. 7 applied to a conductor.

Various forms of solderless terminal lugs have been devised and proposed in the past, but none have enjoyed universal acceptance for one reason or another. Perhaps the most outstanding problem in properly constructing a solderless terminal lug, is that of incorporating therein a satisfactory conductor grip, without unduly increasing the weight of metal constituting the lug. Hard metal in a terminal lug would doubtless increase the gripping power, but such a metal is not generally considered satisfactory for effecting electrical connections. The soft copper specified for terminal lugs lacks the firmness and resiliency necessary to enhance the gripping power, and to increase the gauge and weight of metal in the effort to attain the desired strength characteristics has never proven satisfactory from the cost standpoint. Moreover, the extra weight is prohibitive in many types of installations, and is particularly unfavorable to economy in shipping, storing, and merchandising.

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The foregoing presents some of the primary considerations to be dealt with in fabricating a satisfactory solderless terminal lug. The present invention obviates the objections stated, and enables production of an inexpensive terminal lug of the solderless type, incorporating no excess of metal over and above the amount required to carry the anticipated electric current. The requisite strength and gripping power are attained in the present device, by means of structural improvements or advancements in mechanical design, with the use of universally acceptable conductive metal which is inherently comparatively soft and ductile.

Referring to the accompanying drawing, Fig. 1 indicates the blank from which the solderless terminal lug is formed. The blank comprises a flat plate of copper or other suitable conductive metal, having at one end a tongue 12 perforated as at 13 to receive a binding screw or post.

The opposite end is formed to present a pair of extensions or fingers 14 which, in the completed terminal lug, furnish an insulation gripping means. The intermediate section 15 of the blank may be substantially circular or ovate, and connected to the tongue and to the extension portion 14—14 by means of reduced neck portions 16 and 17 respectively. At substantially the center of the intermediate section 15, a transverse strut 18 is formed by punching out the triangular shapes 19 and 20. The removal of the triangular portions 19 and 20, as will more clearly appear hereinafter, results in the formation of pincer jaws and an intermediate trench or U-shaped loop, all adapted to cooperate in producing a firm and tenacious grip upon the bared end of an electric conductor.

The blank of Fig. 1 is first subjected to a bending operation which elevates the strut portion 18 of the blank above the level of the tongue 12, and the extensions 14. The strap elements 21 and 22 formed by removal of the triangular punchings, are thereby disposed in planes which are transverse to the plane of tongue 12 and also to the major axis of the blank as a whole. The planes of portions 21 and 22 may be disposed roughly or approximately at right angles to the plane of the tongue, although as illustrated by

Fig. 2, the angularity is slightly less than a right angle.

The blank having been formed to the Fig. 2 configuration, it may thereafter be subjected to another bending operation whereby the strut 18 is pressed toward the plane of tongue 12 to the extent of forming the strut into a U-shaped loop or trench, the base 23 of which rests approximately within the plane of the tongue, or slightly above it, as illustrated by Fig. 4. The same bending operation may turn up the extensions 14 into substantial parallelism, but preferably with an inward curve, to produce insulation gripping means that might readily be clamped about the insulated portion of a conductor by simply applying the force of a squeezing tool as may readily be apparent by referring to Figs. 7 and 8. In Fig. 8, 24 indicates the insulated portion of a stranded conductor 25.

The bending or forming operation of Figs. 3 and 4 may include, if desired, the formation of one or more inwardly extended ribs 26 on the inner face of the trench, said rib or ribs being directed from the mouth of the loop toward the base thereof. As shown in Fig. 5, ribs such as 26 are formed or pressed inwardly of the trench, at opposite sides of the latter. When two such ribs are formed as shown, they may be located directly opposite to one another, as clearly shown in Fig. 7, or in an alternative construction, they may be in staggered relationship so as to avoid contacting one another when the jaws of the lug are squeezed together in the manner illustrated by Fig. 8. In either case, the function of the ribs is to clinch the conductor at a location intermediate the pincer jaws as the jaws and the trench are closed upon the bared conductor by means of a squeezing tool applied to the heads 27 of the jaws. It should be understood that ribs such as 26 might in some instances be omitted from the trench, or replaced by any equivalent form of frictional holding means should the interior of the trench require it.

It may be understood by reference to Figs. 2 and 4 and particularly Fig. 7, that the strap portions 21 and 22, as ultimately disposed in the finished device, produce pincer jaws at opposite ends of the trench formed by strut 18. These jaws comprise the inner edges 29 of the straps, which meet at a crotch 30 in the plane of the tongue 12. The strap or body portions of each pair of jaws 21—21, are disposed substantially in a common plane which is transverse to the plane of the tongue, and to the major axis of the device. The gripping edges 29—29 of the pincer jaws, are of a width corresponding to the thickness of the metal of the blank. The foregoing description applies to the jaws 22—22, as well as to the jaws 21—21. The crotch of jaws 22—22 is indicated by the character 31.

By referring to Figs. 5 and 6, it will be noted that the heads 27 of the jaws are bent outwardly and upwardly, and then outwardly and downwardly, from the location of the mouth of the trench, to materially reinforce the jaw heads and render them substantially non-deformable. Thus, when the heads 27 are embraced between the jaws of a pair of pliers, for example, they may be squeezed toward one another to close the trench or loop simultaneously with closing the jaws 21—21 and 22—22, without substantial deformation of the jaw heads. The jaws and the loop of the trench are thusly closed upon the bared end of the conductor, as in Fig. 8. As will readily be understood, the clamping action of

jaws 21—21 and 22—22 is rendered very forceful because of the deformation of said jaws edgewise toward one another. In other words, the closing of the jaws is performed in what may be considered a direction unnatural or opposed to the bending plane of the straps constituting the jaws. This results in the jaws becoming firmly set by deformation of the bulk of metal at the base portions of the jaws, that is, where the jaws meet the comparatively rigid body metal at and about the crotches 30 and 31. Obviously, at these locations the metal will be forced to twist and establish complex bends, as the jaws are squeezed together onto the conductor like suggested by Figs. 7 and 8. Such deformation does not readily tend to return to the original condition, but will "set" the metal to the deformed condition.

The pincer jaws and the loop or trench close onto, and clamp, the bared end of the conductor at a single squeeze of the pliers or other proper tool applied to the heads 27. The same squeezing action may set the insulation grips to the clamping position. Thus, by means of a quick and normal application of a common tool, the conductor is at once clamped at four distinct and separate locations, namely, between two sets of edge-contacting jaws, within the loop or trench, and within the insulation gripper. The bared end of the conductor, which may be either stranded or solid, will preferably be clenched and clamped near the base of the loop and at the crotch region of the jaws, to obtain the maximum holding power.

Slight changes in proportions and structural details may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. In a device of the class described, the combination of a tongue portion, an insulation gripping portion, and an intermediate wire clamping portion, the latter comprising two pairs of pincer jaws spaced apart, and a deformable loop between said pairs of jaws, said loop having a base disposed at substantially the plane of the tongue portion, and jaw heads formed integrally with the loop and the pincer jaws, for reception of a squeezing tool to simultaneously close the jaws and the loop upon a conductor disposed therein.

2. In a device of the class described, the combination of a tongue portion, an insulation gripping portion, and an intermediate wire clamping portion, the latter comprising two pairs of pincer jaws disposed transversely to the plane of the tongue and also to the major axis passing through the tongue portion and the gripping portion aforesaid, and a deformable loop between said pairs of jaws, the loop including a valley extending in the direction of said axis of the tongue portion.

3. In a device of the class described, the combination of a tongue portion, a pair of opposed insulation gripping fingers, and an intermediate wire clamping portion, the latter comprising two pairs of pincer jaws disposed transversely to the plane of the tongue and also to the major axis passing through the tongue portion and between the gripping fingers aforesaid, said pincer jaws each being of a thickness corresponding to the thickness of the material constituting the tongue portion of the device, a deformable loop between said pairs of jaws, the loop including a valley extending in the direction of said axis of the tongue portion, and a pair of opposed heads on the loop, said heads being spaced apart a dis-

tance corresponding substantially to the distance between the insulation gripping fingers.

4. In a device of the class described, the combination of a substantially planar tongue portion, and wire gripping means at one end of said tongue portion, said gripping means comprising at least one pair of divergent pincer jaws disposed in a plane transverse to the plane of the tongue portion, said pincer jaws being initially spaced apart at their upper ends and converging to a V-shaped crotch where the jaws meet the tongue portion, the crotch being located substantially in the plane of said tongue portion.

5. In a device of the class described, the combination of a substantially planar tongue portion, and wire gripping means at one end of said tongue portion, said gripping means comprising at least one pair of pincer jaws disposed in a plane transverse to the plane of the tongue portion, said pincer jaws being spaced apart at their upper

ends and converging to a crotch where the jaws meet the tongue portion, the crotch being located substantially in the plane of said tongue portion, a pair of oppositely directed heads including reinforcing flanges integral with each of said jaws, and an integral conductor clamping loop depending from said heads to a location approximating the plane of the tongue portion.

FRED G. KRUEGER.

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