May 10, 1966 K. M. HAMMELL 3,251,022

ELECTRICAL CONNECTOR CLIP

Filed Aug. 19, 1963 2 Sheets-Sheet 1

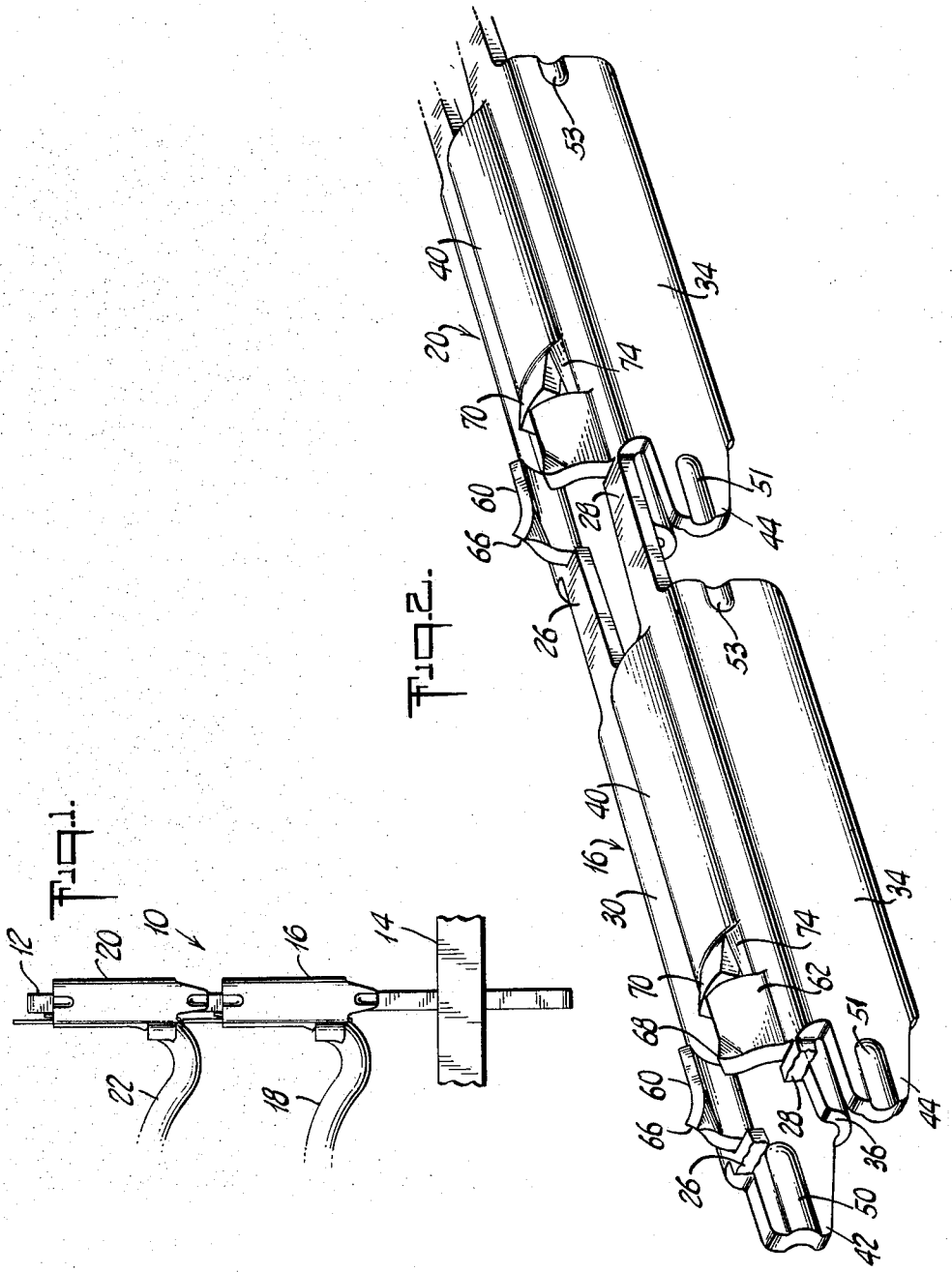

Fig. 2.

Fig. 1.

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Fig. 3.

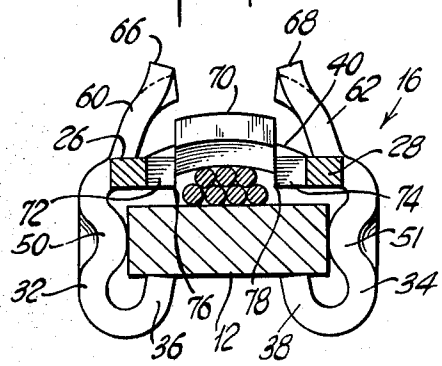


Fig. 4.

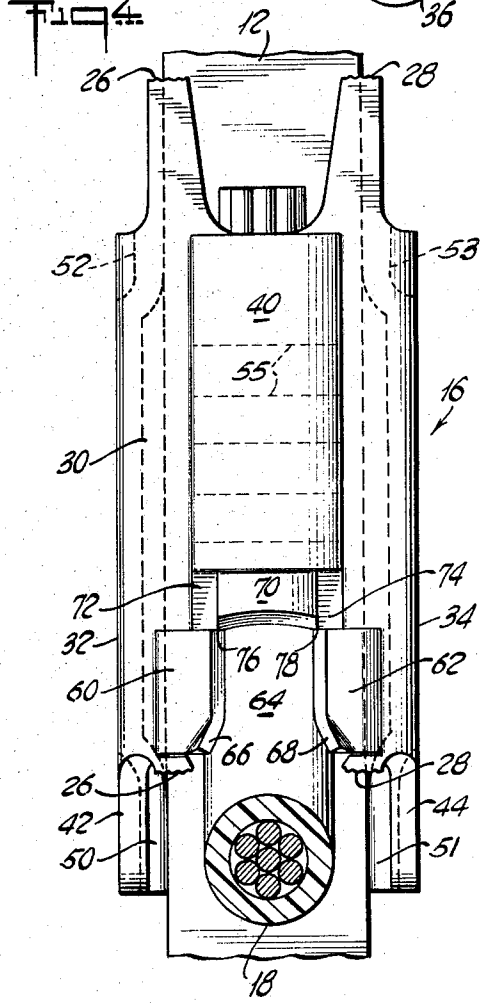
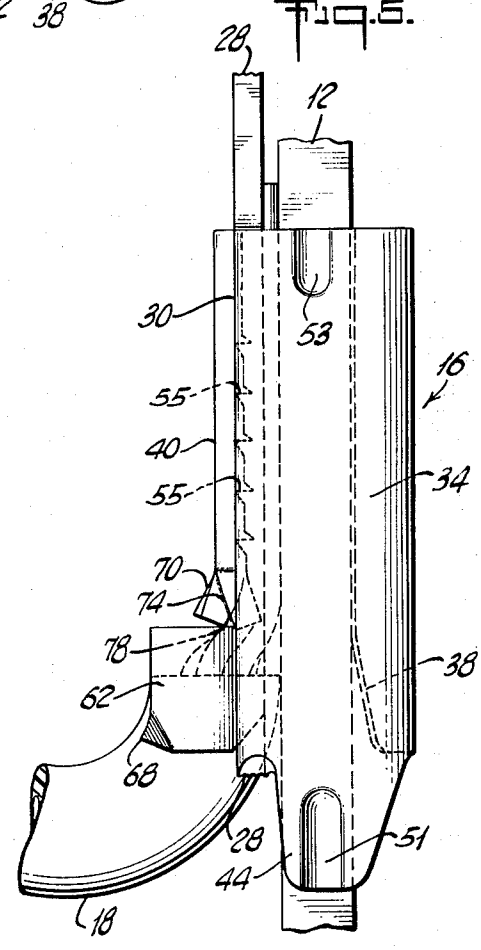


Fig. 5.



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3,251,022

ELECTRICAL CONNECTOR CLIP

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1 Claim. (Cl. 339—97)

This invention relates to an improved electrical connector clip or terminal clip of the general type disclosed in U.S. application Serial Number 171,074, filed February 5, 1962.

An object of this invention is to provide an inexpensive and simple connector clip which is particularly effective and reliable in electrically connecting stranded wire to a terminal post.

Another object is to provide a connector clip which fits with great precision on a terminal post regardless of minor dimensional variations.

A further object is to provide a clip which gives a connection highly immune to damage to itself, to another clip connection on the same post, or to wires in the vicinity of the post.

These and other objects will in part be understood from and in part pointed out in the following description.

In the above-identified patent application there is disclosed an entirely new system wherein a wire is electrically connected to a terminal post by means of a clip-like connector. This connecter is applied in a unique, single stroke operation to the wire and terminal, the connector being slid axially onto the end of the terminal post and, in the process, dragging the wire under the connector and along the post. This operation removes or breaks away any insulation on the portion of the wire under the connector and establishes an intimate, metal-to-metal contact between wire and post.

Where a stranded wire is being connected to a post by a clip in accordance with the system described above, the individual strands of the wire have a tendency to spread apart or splay under the clip and thereby cause a faulty connection. The present invention provides a connector clip which effectively bunches the strands of a stranded wire and insures consistently perfect connections between wire and post.

To make multiple connections on a given post, two or more clips and the respective wires beneath them are stacked in sequence on the post. Now each clip is, in actual practice, driven at high speed (faster than the eye can follow) onto the post. As a consequence, a clip in the course of sliding onto the post is moving so fast that it can slash through the insulation of a wire which happens to lie near or against the base of the post. Also, where one clip is already on the post, the second may slam into it and push it forward. The present invention provides a clip having a configuration which minimizes the chance of damage to itself, to a previous clip on the post, or to a nearby connecting wire, when a connection is being made.

In accordance with the invention, in one specific embodiment thereof, the top web of a channel-shaped clip is formed with a concavely rounded center portion extending along the axis of the clip. This rounded part of the web serves to bunch or focus the strands of a stranded wire into a substantially solid whole and thereby insure that a proper connection is made between wire and post. By preventing the splaying of the wire strands beneath itself, this clip is able consistently to deform the wire a predetermined amount and to hold it against the post with the designed holding force. As a result, connections made with this new clip and stranded wire are uniformly as good and reliable as connections made with a solid wire and a clip having a flat web. Of course, this new clip

is able to handle solid wire as easily and as well as it does stranded wire.

The front of the clip is provided with extended side walls which project beyond the main body of the clip and serve as bumpers when the clip is driven against the rear of another clip on a a post. This minimizes the danger of one clip damaging another. To keep each clip precisely centered on a post, the side walls of the clip near the front and rear edges have shallow dimples which extend inward and which slide lightly along the side faces of the post. These four dimples prevent the clip from skewing as it moves along the post and give very accurate seating of the clip on the post.

The front part of the top web of the clip is formed into two specially shaped, struck-up tabs which engage the insulation on a wire just above the point where the bare end of the wire passes beneath the web of the clip and is ironed against the post. These insulation tabs are able to accommodate a wide range of insulation thicknesses without affecting the seating of the clip on the post. In previous clips when the insulation was too thick, it lifted the front end of the clip from the post and gave an imperfect connection. The shape and position of the tabs on this new clip are further designed to prevent their cutting into the insulation of the wire being held by the clip or of other wires in the vicinity.

A better understanding of the invention together with a fuller appreciation of its many advantages will best be gained from the following description given in connection with the accompanying drawings wherein:

FIGURE 1 is a perspective view of an electrical terminal post with two clips and their respective wires stacked on the post,

FIGURE 2 is an enlarged perspective view of two clips embodying the invention and shown here in end-to-end continuous strip relation,

FIGURE 3 is an enlarged end view of a clip connecting a wire to a post,

FIGURE 4 is a top view of the clip in FIGURE 3, and

FIGURE 5 is a side view of the clip and post.

The multiple electrical connection **10** shown in FIGURE 1 includes a long, thin metal post **12** which projects from a base panel **14**. Posts such as this one are standard in the industry. Mounted on the post is a first connector clip or terminal clip **16** which has been slid axially from the top of the post toward the base by means of a tool such as disclosed in the above-identified patent application. In the course of being applied to the post, the clip picks up the end of an insulated wire **18**, the end of which is then stripped of insulation, drawn under the web of the clip and then ironed against the post. When only a single clip is put on the post, the final position of the clip is normally somewhat higher relative to panel **14** than is shown in FIGURE 1. Here, however, a second clip **20**, and its wire **22** have been applied to the post. In the course of being seated clip **20** has bumped against clip **16** and driven it down about half a clip length. It will be noted that both clips remain properly aligned and engaged on the post and that wire **22** has not been damaged by the rear end of clip **16**.

Both clips **16** and **20** are of course identical and were formed from a continuous strip of metal, such as brass, by means of a progressive die of suitable configuration. Clips **16** and **20** in continuous end-to-end relation are shown in FIGURE 2. Clip **16** was previously joined to a clip ahead of it (not shown), whereas the rear of clip **16** is shown still joined at points **26** and **28** to the front part of clip **20**. Clip **16** was sheared or torn from clip **20** at these points in the course of being applied to post **12**, and similarly clip **20** was separated from the clip behind it.

As seen best in FIGURES 3, 4 and 5, clip **16** (and clip **20**) is generally channel shaped. The clip has a top web **30**, two side walls **32** and **34**, and two curled-over legs **36** and **38**. The latter resiliently engage the underside of post **12**, and except for the light contact at the dimpled areas of the side walls are the only portions of the clip which engages the post. The spring action of these legs together with a controlled deformation of web **30** permit the clip to be used with a wide range of wire sizes.

Web **30** as seen in FIGURE 3 is convexly bowed in its center part **40** for the full length of the web, as seen in FIGURE 4, this convexly bowed center forming an axially extending trough on the web. The radius of curvature of bowed part **40** is designed so that the inner face of the web will bunch the individual strands of a stranded wire into a packed bundle beneath the clip and prevent splaying. Thus stranded wire behaves as though it were solid, and consistently perfect connections are assured. A single clip is able to handle a range of wire sizes. For example, a clip having an outside width of 0.092 inch, a length of 0.212 inch, and other dimensions substantially to the scale shown in FIGURES 3, 4 and 5, is able to handle A.W.G. Nos. 22, 24 and 26 stranded, and Nos. 20, 22 and 24 solid wires. To handle smaller wires, the radius of curvature of bowed portion **40** would be suitably reduced.

As seen in FIGURES 4 and 5, side walls **32** and **34** have forward noses **42** and **44** which project well beyond the main body of the clip and serve as bumpers when a second clip, such as clip **20** in FIGURE 1 slams against clip **16**. These side walls are dimpled in areas **50**, **51**, **52** and **53**, at their front and rear edges to provide light engagement with the sides of a post (see FIGURE 3) and thereby insure that the clip is properly aligned on the post. The front, top edge and bottom edge of each nose are rounded and tapered as shown in FIGURE 5 so that the clip will not cut through the insulation of a wire perchance lying in the path of the clip, but will cam the wire out of the way. In order to lock the wire end beneath it to the clip the inner face of web **30**, as seen in FIGURE 5, is serrated along transverse lines **55**.

The front part of top web **30** has a pair of struck-up tabs **60** and **62** which, as seen in FIGURE 3, provide a somewhat bell-shaped mouth **64** for engaging the insulation of a wire. The very tops of these tabs are curved slightly inward and their front corners are flared out at **66** and **68** respectively. The turning back of these sharp corners permits the wire held by the clip to be dressed either to one side of the clip or the other and further minimizes the danger of the clip cutting into other wires.

Behind tabs **60** and **62** is a tongue **70** which is bent up from the bowed part **40** of web **30**. This tongue provides a tapered entrance for a wire to extend back beneath the web and against the post. On each side of tongue **70** are the small areas **72** and **74** which, as seen in FIGURE 5, are bent down to give, as seen in FIGURE 3, the sharp knife edges **76** and **78**. The latter, when a clip is being applied to a post by a tool as described in

the above-mentioned patent application, insure that the insulation on the end of the wire is thoroughly stripped off before the metal of the wire is drawn under the web of the clip. Thorough stripping of the wire is important here since otherwise the insullation material, such as plastic vinyl, may lodge between web **30** and the post and prevent proper deformation of the wire metal against the post.

The drawings of FIGURES 3, 4 and 5 show the shape and various features of clip **16** substantially to scale.

The above description is intended in illustration and not in limitation of the invention. Various minor changes in the embodiment illustrated may occur to those skilled in the art and can be made without departing from the spirit or scope of the invention as set forth.

I claim:

A terminal clip for making clip-type electrical connections between a conductor and a terminal post, said clip comprising a web portion and a pair of sidewalls, said sidewalls being reversely curled inwardly towards each other and towards said web whereby, said clip is adapted to be telescopically moved onto said post, said web being outwardly bowed along substantially its entire length as viewed in transverse cross-section to form an axially extending trough on said web, said trough functioning to gather and bunch the strands of a stranded wire, while said clip is being moved onto a post and is dragging a wire onto a post, and said trough functioning to hold said strands against said post in a packed bundle after application of said clip to said post, said sidewalls extending axially beyond said web at corresponding ends to provide bumpers for engagement with a previously applied terminal clip on a post, each of said sidewalls having at least two spaced-apart inwardly directed dimples to maintain said clip in coaxial relationship to a post after application.

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