April 24, 1962 G. E. MILLER 3,031,002

DEVICE FOR SECURING TERMINALS TO WIRES

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FIG. 1

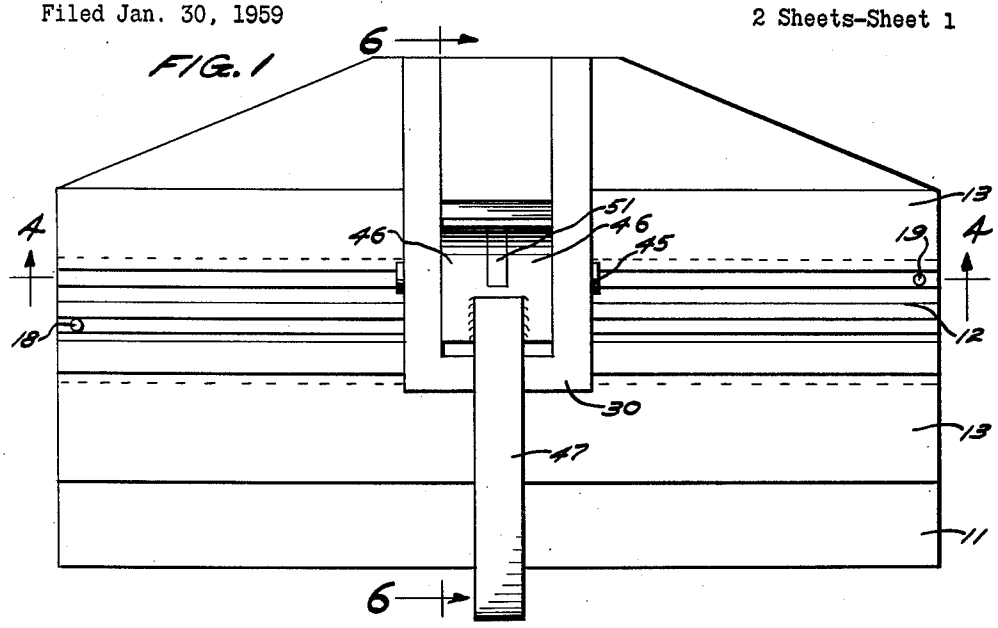

FIG. 2

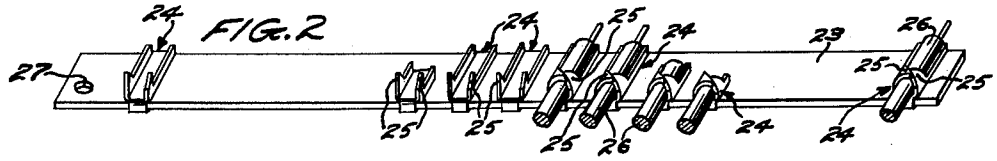

FIG. 3

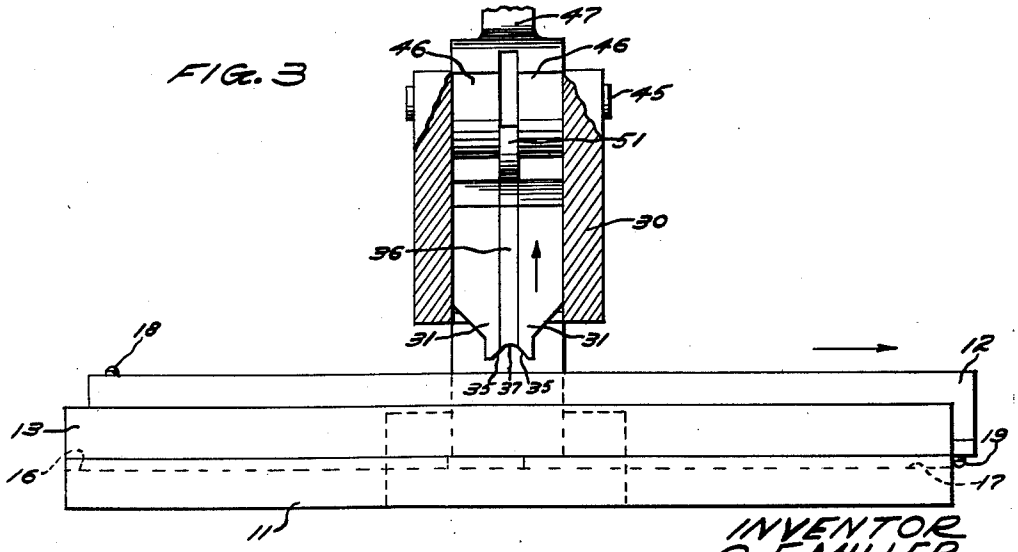

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FIG. 4

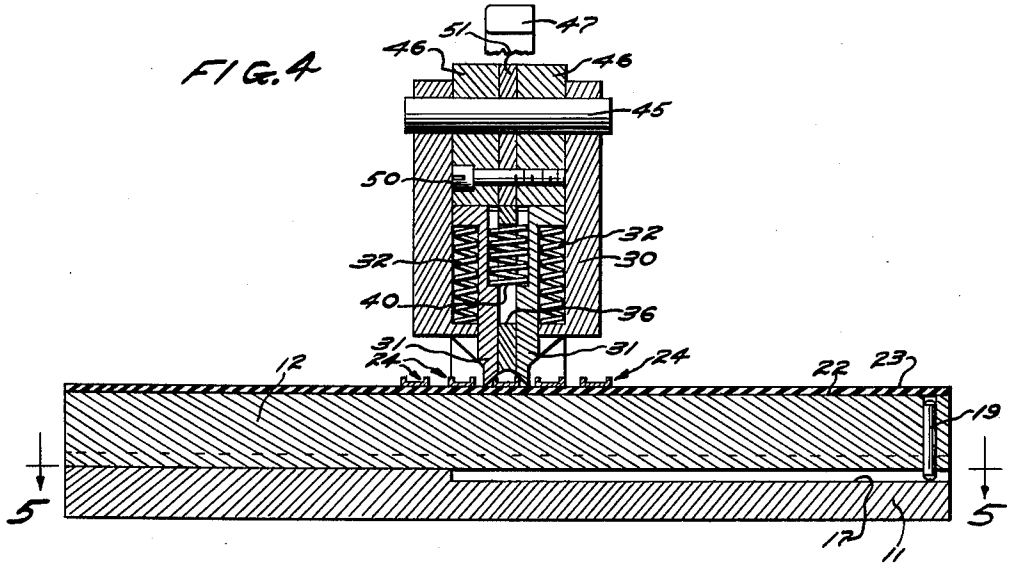


FIG. 5

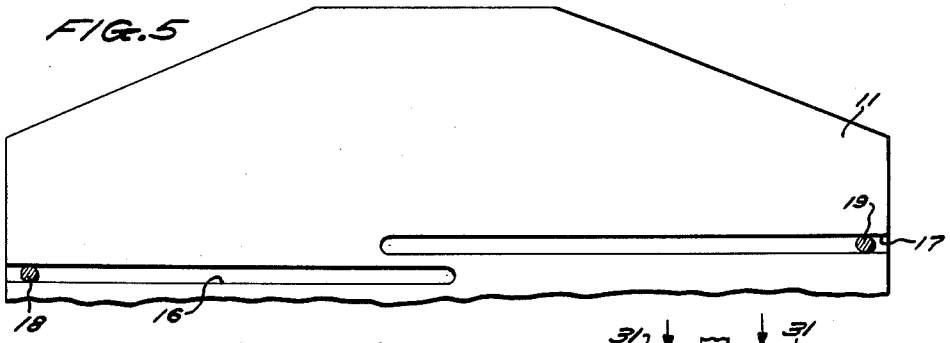


FIG. 6

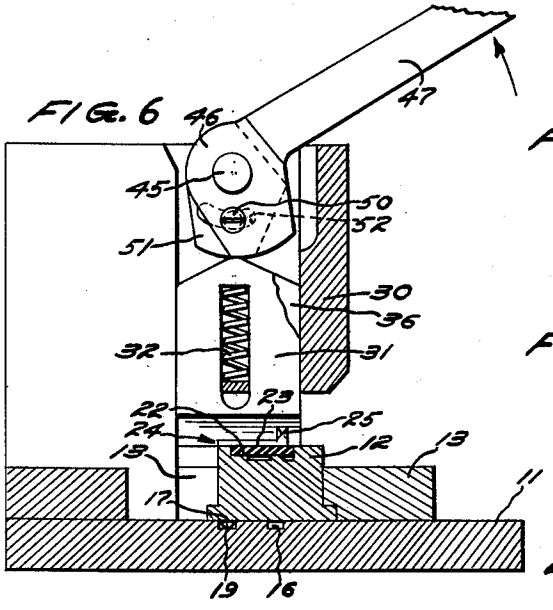


FIG. 7

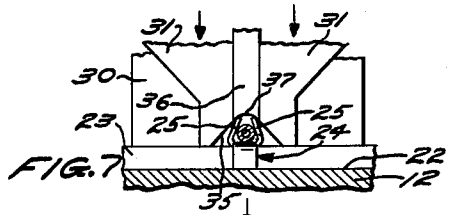
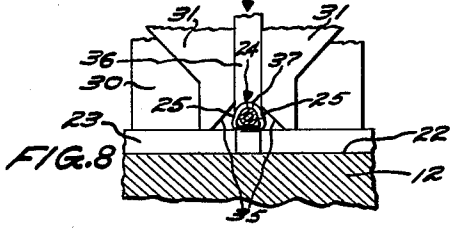


FIG. 8



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DEVICE FOR SECURING TERMINALS TO WIRES

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1 Claim. (Cl. 153—1)

This invention relates to devices for securing terminals to wires and most particularly to devices for crimping lugs of a terminal around a wire.

A common procedure in the past has been to utilize a unitary forming member for engaging and bending lugs or portions of a terminal around a wire. One of the disadvantages of such a procedure is that the ends of the bend portions of the terminal are not adequately crimped. Another disadvantage of the use of such a forming member is that the lugs of the terminal are always bent into the same configuration, regardless of the size or nature of the wire to which the terminal is attached.

With this problem in mind, one of the objects of this invention is to provide a device which crimps terminal lugs onto a wire by camming the lugs inward over the wire and then bending the ends of the lugs downward onto the wire, this bending commencing at a variable time within the camming step so as to facilitate an adjustment of the final bend configuration of the lugs.

Another object of this invention is to provide a novel and improved device for adequately crimping end portions of terminal lugs onto a wire.

A further object of this invention is to provide a device having a pair of elements for engaging and bending a pair of spaced lugs of a terminal about a wire and a third element for then engaging the lugs and completing the bend therein.

Still another object of this invention is to provide a device for clinching lugs of a terminal onto a wire wherein each lug is bent in a sequence by a pair of bending elements, the actions of the bending elements being separated by a time interval which is variable.

One embodiment of the present invention may include a pair of spaced bending elements adapted to engage and bend a pair of spaced terminal lugs inward toward each other around a wire, and a third bending element for engaging the ends of the partially bent lugs and completing the crimping of the lugs onto the wire. The bending elements are actuated by cams which are adjustable relative to each other so as to adjust the relationship of the third bending element with the pair of bending elements. Thus, the third bending element may be adjusted to engage the lugs at different stages of the operation so as to vary the final configuration of the lugs.

Other objects and advantages of the invention will become apparent by reference to the following detailed description and the accompanying drawings illustrating an embodiment of the invention in which:

FIG. 1 is a plan view of a device embodying the principles of the invention and showing the general construction of the device;

FIG. 2 is a perspective view of a piece part which is to be fabricated by the instant device, showing terminal lugs which are to be clinched onto wires;

FIG. 3 is a front view of the device showing bending elements of the device in elevated positions;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 1 illustrating the arrangement of the bending elements;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4 showing grooves in a base of the device which are utilized to limit movement of that part of the device which supports the terminals;

FIG. 6 is a cross sectional view taken along line 6—6 of FIG. 1 depicting the shapes of cams that actuate bending elements of the device;

FIG. 7 is an enlarged fragmentary sectional view showing the lugs of the terminal after a first bend has been made therein; and

FIG. 8 is an enlarged fragmentary sectional view showing the lugs of the terminal after the bending operation is completed.

Referring now in detail to the drawings, a base 11 slidably supports a carriage 12 which is positioned between a pair of guide members 13 secured to the base 11. The base 11 is provided with spaced grooves 16 and 17 which receive the lowermost ends of pins 18 and 19, respectively, secured to the carriage 12. The lower end of the pin 18, riding in the groove 16, limits the movement of the carriage 12 to the right, while the lower end of the pin 19 rides in the groove 17, thereby restricting movement of the carriage 12 to the left.

The carriage 12 is provided with a longitudinal groove 22 adapted to receive a strip 23 to which is secured at spaced intervals a plurality of terminals 24. Each of the terminals 24 is provided with the spaced pair of lugs or ears 25 which are to be bent inwardly toward each other over the end of a wire 26. One end of the strip 23 is provided with an aperture 27 for receiving the pin 18 to properly position the strip 23 in the groove 22.

A frame 30 mounted above the base 11 slidably supports a pair of bending elements 31 which are normally urged upward by compression springs 32 (FIGS. 4 and 6). The lower ends of the bending elements 31 are provided with camming surfaces 35 which engage the lugs 25 and bend these lugs toward each other over the wire 26 which has been manually positioned therebetween.

A third bending element 36 slidably positioned between the bending elements 31 is normally urged upward by a compression spring 40 (FIG. 4) engaging the bending elements 31 and positioned in a slot in the bending element 36. The lower end of the bending element 36 is provided with an arcuate surface 37 which is adapted to engage the ends of the lugs 25 after they have been formed by the bending elements 31 and to thereby complete the crimping operation.

A pin 45 secured to the frame 30 supports a pair of spaced cams 46 which engage the upper ends of the bending elements 31 for moving these elements downward when a handle 47 attached to the cams 46 is manually operated. A bolt 50 extending through the cams 46 is adapted to squeeze these cams together and thereby hold a third cam 51 therebetween, the bolt 50 passing through a slot 52 in the third cam 51. The third cam 51 engages the third bending element 36 and forces it downward at a stage of the operation when the lugs 25 have been partially bent by the bending elements 31 so as to engage the ends of the lugs 25 and complete the crimping operation. By loosening the bolt 50, the third cam 51 may be adjusted relative to the pair of cams 46 to vary the final configurations of the lugs 25.

In operation a strip 23 carrying terminals 24 is manually positioned in the slot 22 and the carriage 12 is manually moved until one of the terminals 24 is positioned beneath the bending elements 31 and 36. The end of a wire 26 is then manually positioned between the lugs 25, and the handle 47 is actuated counterclockwise as shown in FIG. 6. As the handle 47 is moved, the cams 46 first force the bending elements 31 downward so that the lugs 25 of the terminal 24 are engaged by the surfaces 35 and are bent inwardly toward each other. The third cam 51 then forces the third bending element 36 downward and into engagement with the ends of the lugs 25. The third bending element 36 thereby completes the crimping operation.

The handle 47 is then raised, the carriage 12 moved to position the next terminal 24 beneath the bending elements, and the above operation is repeated.

If the bolt 50 is loosened and the third cam 51 is adjusted counterclockwise (FIG. 6), the third bending element 36 will be actuated earlier relative to the bending elements 31 to cause the final bend configuration of the lugs 25 to have a smaller radius since the lugs 26 are engaged by the third bending element while they are closer to vertical. Conversely, if the third cam 51 is adjusted clockwise, the final configuration of the lugs 26 will be flatter. This accommodates wires of various sizes.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

Apparatus for clinching a channel shaped terminal to a wire wherein the terminal includes a bail portion and a pair of spaced substantially parallel legs, which apparatus comprises, a base for supporting the terminal and the wire, a pair of spaced substantially parallel bending elements mounted for movement toward the terminal in a direction substantially parallel to the legs of the terminal when the terminal is supported on said base, said bending elements including camming surfaces for engaging and initially bending the legs of the terminal toward each other about the wire, a third bending element slidably positioned between said pair of bending elements

having a substantially convex camming surface, said third bending element being slidable relative to said pair of bending elements toward the terminal after the initial bending of the legs by said pair of bending elements whereby the convex camming surface engages and further bends the legs of the terminal about the wire to complete the clinching operation, a pair of spaced movably mounted cams for operating said pair of bending elements, a third cam positioned between said pair of cams for operating said third bending element, said third cam being adjustable relative to said pair of cams so that the time of operation of said third bending element relative to the time of operation of said pair of bending elements can be altered, thereby to control the final bend configuration of the legs of the terminal selectively in accordance with the size and the nature of the wire, releasable means for locking said third cam to said pair of cams for movement therewith during the clinching operation, and resilient means biasing said pair of spaced bending elements and said third bending element into engagement with their respective cams whereby movement of said cams operates said bending elements.

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