Feb. 11, 1958 L. EICKHOFF 2,822,545

TERMINAL CRIMPING DIE

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Fig. 2

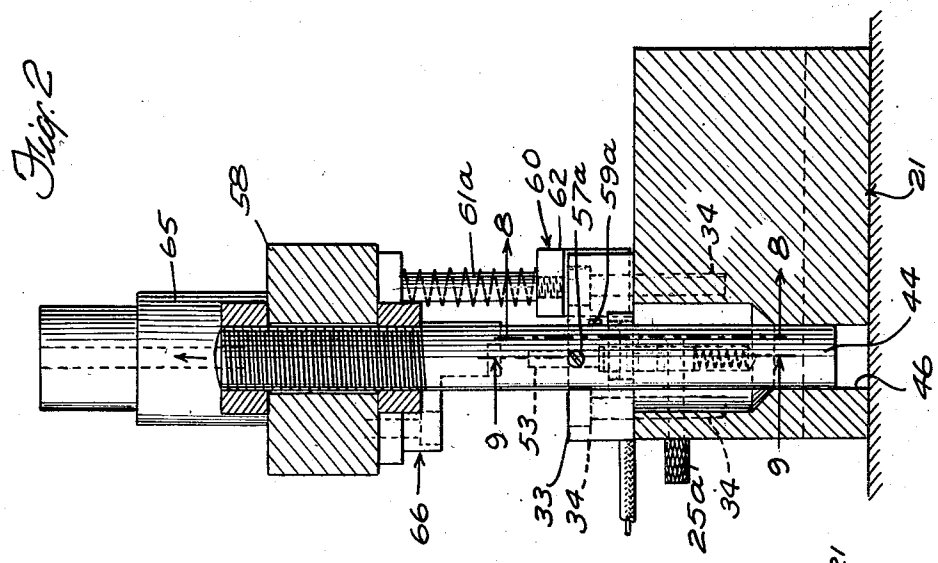
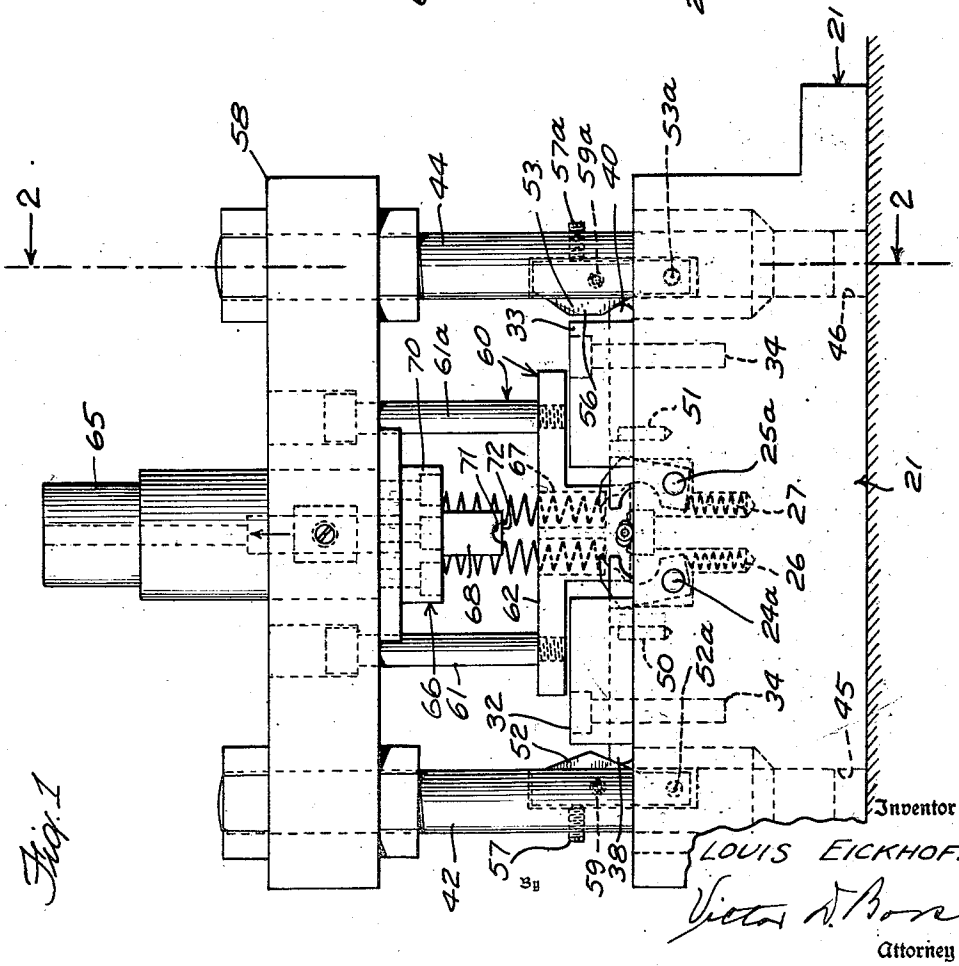


Fig. 1



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Fig. 4

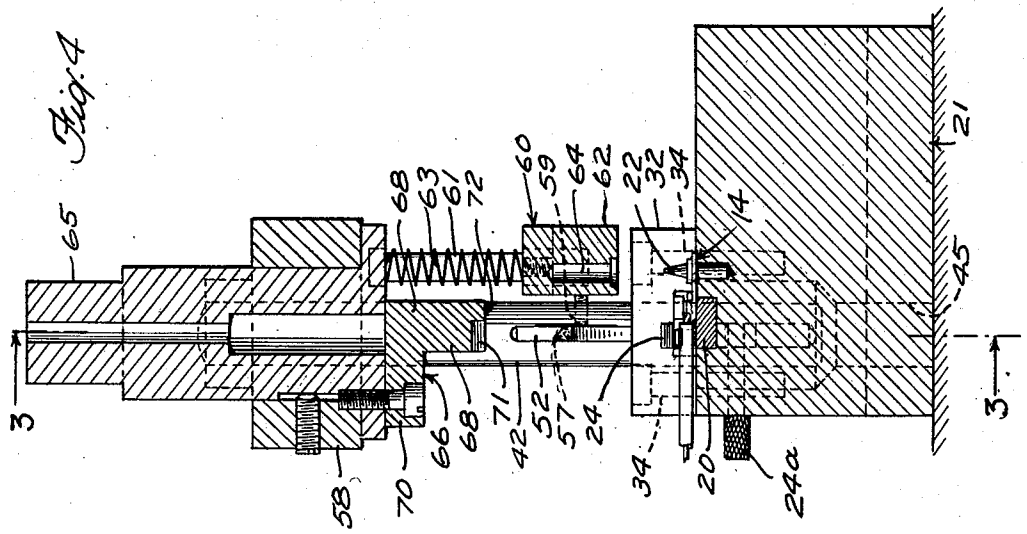
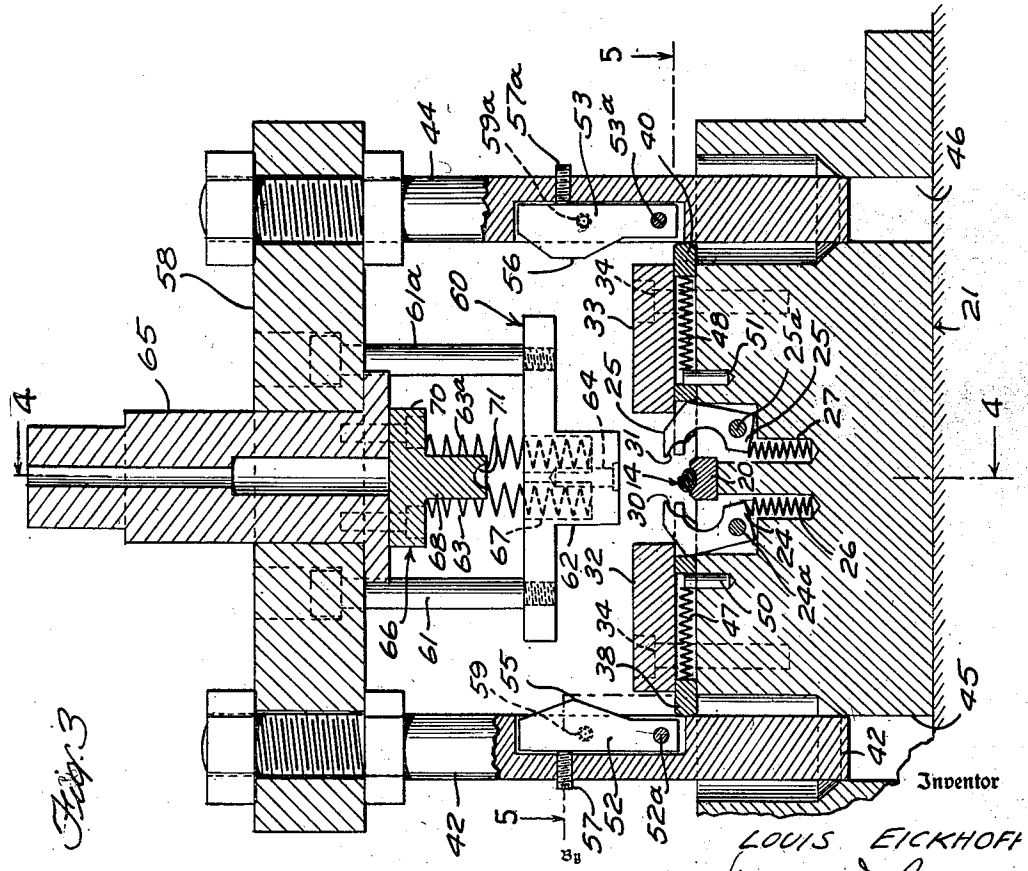


Fig. 3



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Fig. 5

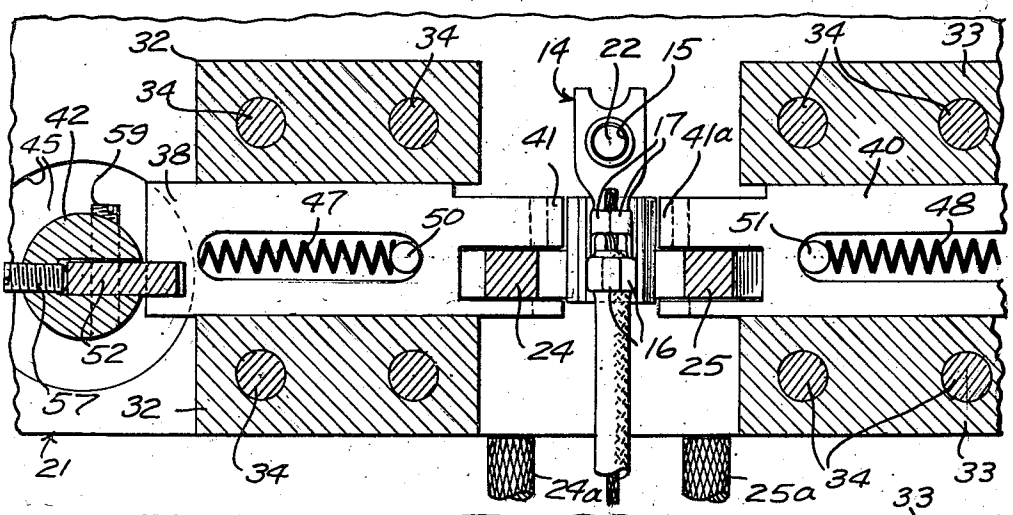
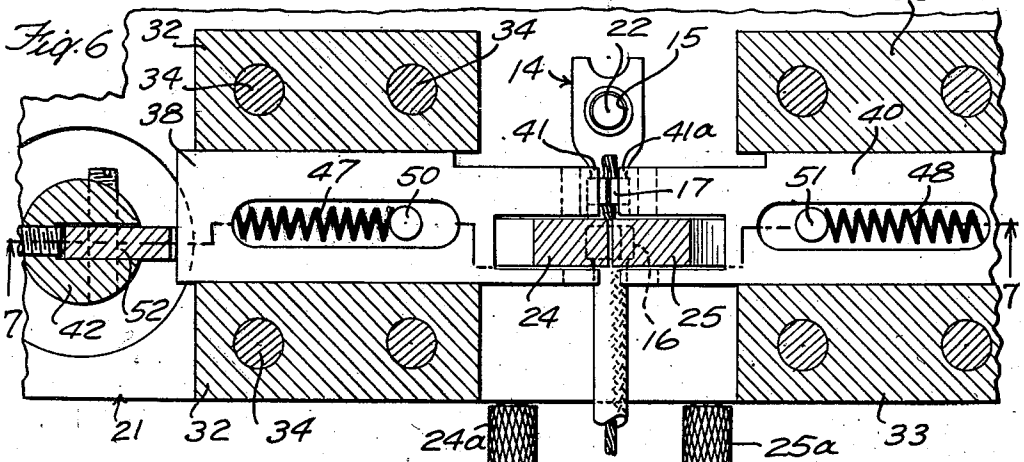


Fig. 6



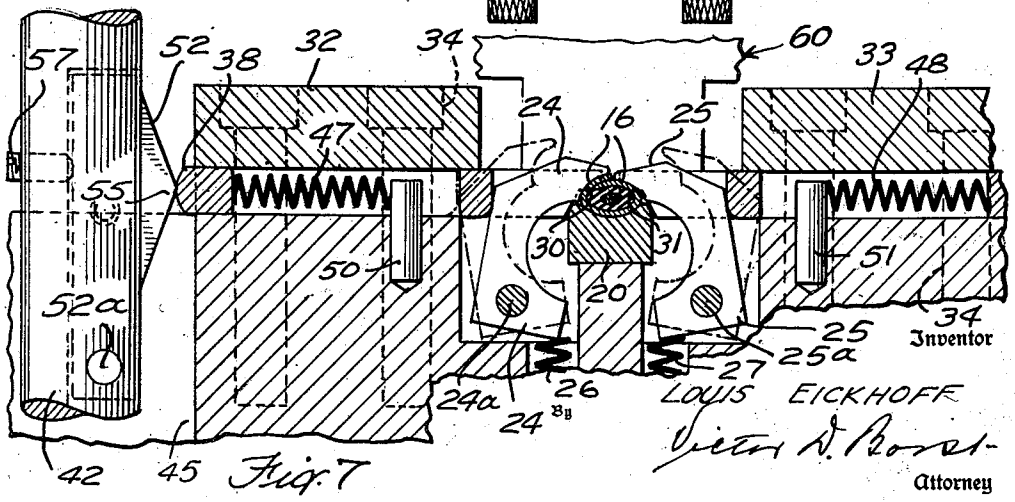


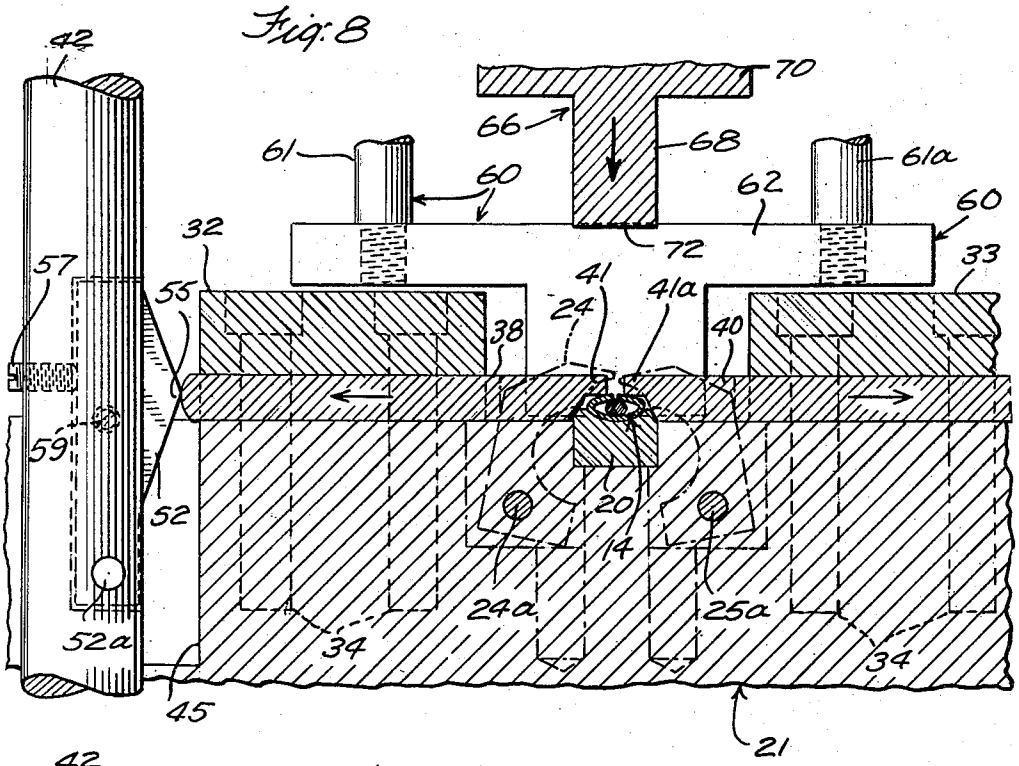
Fig. 7

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Fig. 8



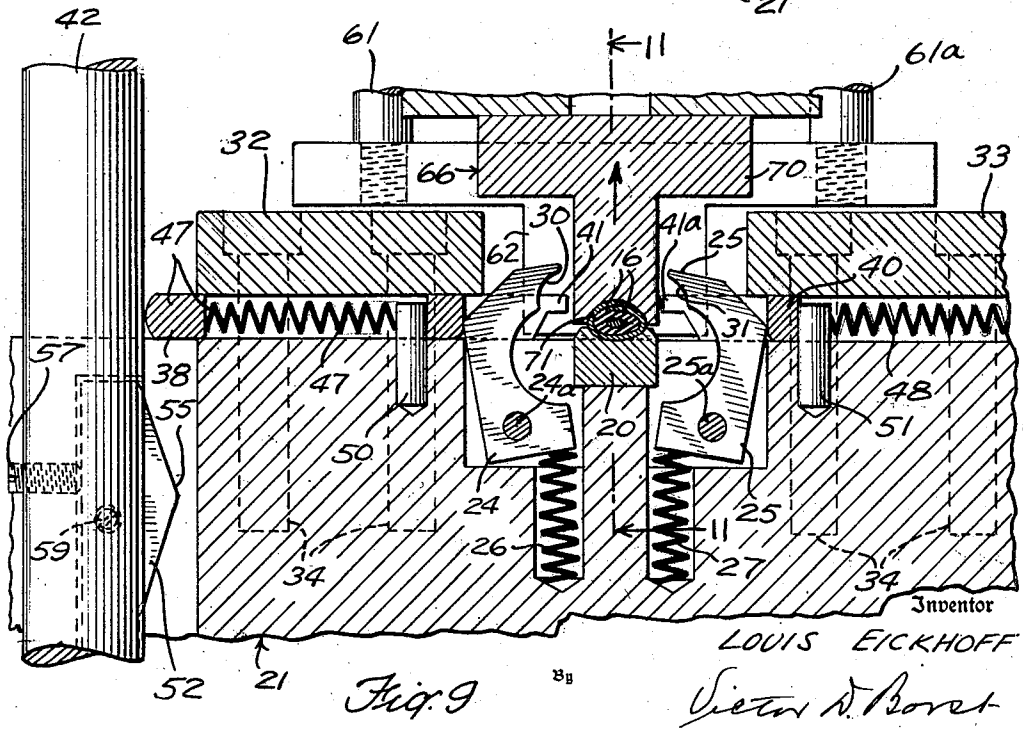


Fig. 9

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Fig. 10

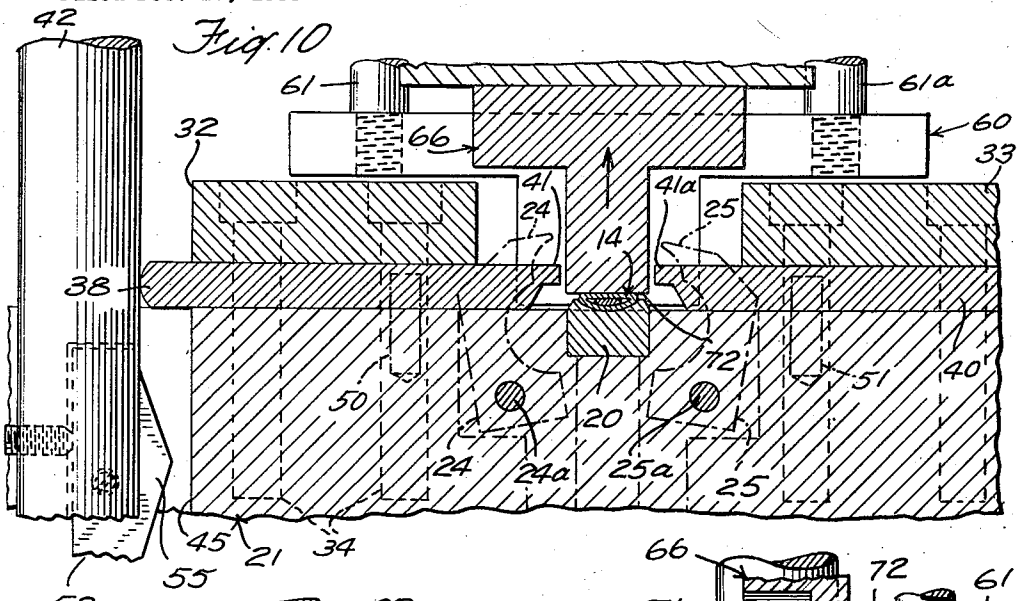
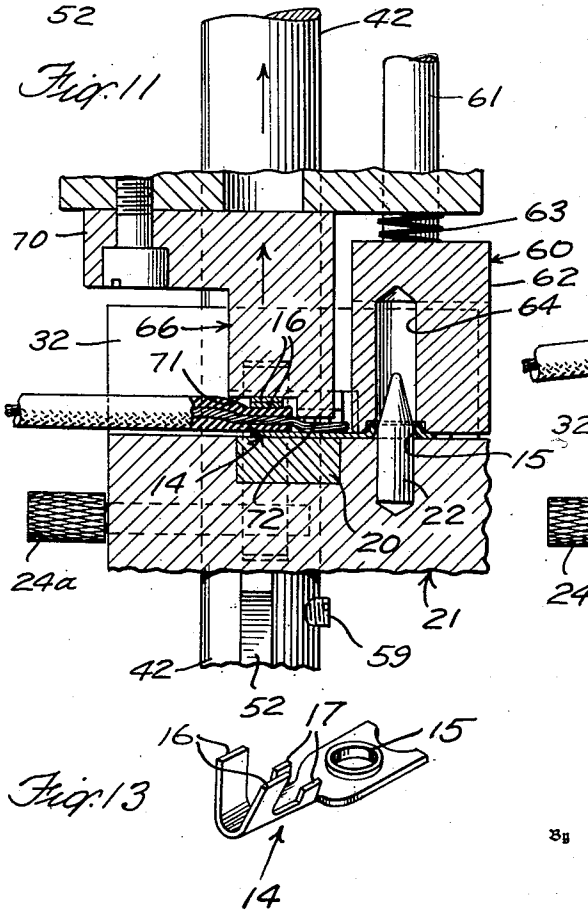


Fig. 11



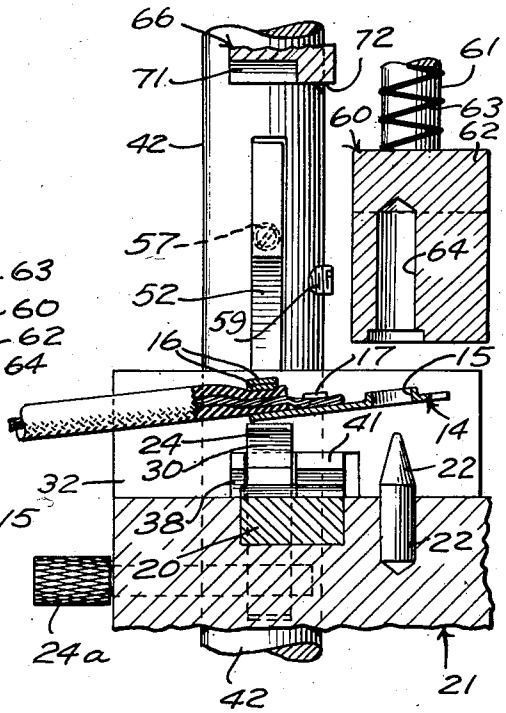


Fig. 12

Fig. 13

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TERMINAL CRIMPING DIE

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Application December 29, 1953, Serial No. 400,846

4 Claims. (Cl. 1—222)

This invention relates to a crimping device for securing terminals having flexible lugs to insulated conductors.

The device which embodies the invention has a dual function, namely, to attach terminals securely to conductors and to insure good electrical contact between the terminals and the conductors. The invention contemplates the adoption of terminals having flexible, upstanding lugs which serve to bind the terminals to the insulated covering of the conductors and to make connection with the uninsulated or bare portion of the conductor. Preferably these functions are achieved in two operations. Firstly the invention provides means for deflecting the lugs in the direction of the conductor lying between the terminal lugs and secondly percussion means are provided to clamp the lugs securely onto the insulated and uninsulated portions of the wire. In practice the second operation may be dispensed with and the deflecting elements may be sufficient to achieve the results for many wiring purposes.

It has been found that the best results are obtained when the insulation lugs are overlapped on the insulation and sufficiently deformed during the deflecting operation to conform to the curvature of the insulated portion of the wire and thereby insure maximum area of contact therewith. Accordingly means are provided to deflect the lugs successively and also to deform the deflected lugs to the desired curvature. Associated means are provided with the deflecting elements to hold the terminal securely in place during operation.

It is therefore an object of the invention to provide a device for crimping terminal lugs onto the insulated and uninsulated portions of a wire.

It is a further object of the invention to provide a device which rigidly and permanently secures crimped terminal lugs to the wire.

Another object of the invention is to provide a device for successively deflecting terminal lugs over against a conductor while imparting a curvature to the lugs in substantial conformity to the wire insulation.

Other objects and advantages of the invented device may appear from reading the following description and accompanying drawings.

Fig. 1 is a front elevation of the crimping device showing the terminal clamp in operative position before releasing the terminal and conductor secured thereto;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is an elevation in section of the device taken on the line 3—3 of Fig. 4 showing the terminal clamp withdrawn from operative position;

Fig. 4 is a central section taken on the line 4—4 of Fig. 3;

Figs. 5 and 6 are fragmentary views in enlarged section taken on the line 5—5 of Fig. 3 showing successive stages of operation of the deflecting elements on the return stroke of the press;

Fig. 7 is a fragmentary vertical section taken on the line 7—7 of Fig. 6 showing the reflecting elements about to be withdrawn;

Fig. 8 is an enlarged vertical section taken on the line 8—8 of Fig. 2;

Fig. 9 is an enlarged fragmentary section taken on line 9—9 of Fig. 2 with the terminal lug clamping elements of the press in lowermost position;

Fig. 10 is a vertical section to the rear of that shown in Fig. 8 showing the press exerting final pressure on the contact lugs of the terminal;

Fig. 11 is a section taken on the line 11—11 of Fig. 9;

Fig. 12 is a section similar to Fig. 11 showing the press in uppermost position and the assembled terminal and conductor; and

Fig. 13 shows a terminal contact appropriate for use with the crimping device.

Referring to Fig. 13 the numeral 14 refers generally to the terminal contact that is to be attached to wire conductors by the crimping device. The hole 15 formed in one end of the terminal is provided for applying the terminal to a battery or other electrical device and also is used in holding the terminal while it is being attached to a wire in the manner contemplated by this invention. The upstanding lugs 16 are flexible and adapted to wrap about the insulation of the conductor whereas the flexible lugs 17 form the electrical connection between the bare wire of the conductor and the terminal.

A cradle 20 is removably secured to a base 21 as by a screw (not shown) and preferably has a depression in its top face in which the body portion of terminal 14 resides. A pin 22 is removably secured in the base 21 and has an upwardly extended, tapered head which is adapted to enter the terminal hole 15 of the contact.

Pivotal jaws 24 and 25 are disposed on each side of the cradle 20 having their axial shafts 24*a* and 25*a*, respectively, transversely supported in the base below the cradle 20. Springs 26 and 27 disposed within the base below the jaws on the cradle side of the shafts 24*a* and 25*a* urge the jaws away from the cradle 20. The crimping faces 30 and 31 of the jaws 24 and 25, respectively, are adapted to engage the insulation lugs 16 and are concave in order to impart curvature to the lugs 16 which generally conforms to the insulated covering of the conductor. Maximum contact and therefore gripping is attained by the lugs 16 on the insulation due to the general congruity in the curvatures of the lug and the insulation. Withdrawal of the removable shafts 24*a* and 25*a* permits the jaws to be removed and replaced for various size wires and insulated coverings.

Inverted U-shaped members 32 and 33 are permanently attached to the base 21 as by bolts 34. These members provide channels in which are disposable slidable crimping plates 38 and 40 which are supported by the base 21 and are adapted to abut the jaws and pivot them in the direction of the cradle 20. The plates have inwardly extending fingers 41 and 41*a* adapted to engage and deflect the contact lugs 17 of the terminal.

Supported indirectly by a press (not shown) are rods 42 and 44 which are adapted to slide vertically in bores 45 and 46 respectively in the base 21. The plates 38 and 40 are urged in the direction of the rods by compression springs 47 and 48 respectively. The springs are disposed in centrally located slots in the plates and exert an outward bias on the plates and are backed by thrust pins 50 and 51 embedded in the base 21.

The rods 42 and 44 are reciprocally driven in the bores 45 and 46 and carry in recesses in their intermediate portions adjustable cams 52 and 53. The cams are pivoted on stub shafts 52*a* and 53*a* their pivotal position being adjustable by means of adjustment screws 57 and 57*a*. Set screws 59 and 59*a* are disposed in the rods adjacent the recesses and clamp on the cams to hold them in adjusted position. The operative surfaces of the cams 52 and 53 contact the outer ends of the plates 39 and 40, respec-

tively, on each stroke of the rods. Accordingly the plates are moved inwardly against the springs 47 and 48 to engage the contact lugs 17 and pivot the jaws against the insulation lugs 16 once in each cycle. The angular disposition or rises of the contact faces of the cams and therefore the relative positions of the apexes 55 and 56, which determine the time that the plates reach their extreme inner positions, differ for the two cams. This causes the plates to be deflected successively and the lugs 16 overlapped. The advantage of overlapping the lugs is twofold. Firstly, it imparts a firmer and more durable clamp. Secondly, it gives greater flexibility of operation. Were the lugs to meet end to end for a given size wire, they would meet out of contact with the conductor for smaller diameter wires. In practice it has not been found necessary to overlap the contact lugs 17 and, as shown in Fig. 10, no provision for overlapping them has been made.

Cross member 58 connects the two rods 42 and 44 at the top of the device. The cross member supports terminal clamp 60 which consists of two vertically disposed bars 61 ad 61*a* slidably supported in guide bores in the cross member 58, and a holder 62 attached to the bottom of the bars. The holder 62 is urged in the direction of the cradle by springs 63 and 63*a* and is limited in its downward movement by the heads of the bars which are larger in diameter than the reduced necks of the bores in which the shanks of the bars 61 and 61*a* are guided. The springs engage post 65, which is carried by the cross member 58, and are supported in wells 67 in the holder. The holder 62 is provided with a bore 64 which is disposed directly over the pin 22 and adapted to seat thereon when the holder is brought down.

Depending from the post 65 and the cross member 58 forward of the terminal clamp 60 is press block 66. The press block has a vertically extending element 68 integrally connected with a horizontal element 70 which is bolted to the bottom of post 65. The bottom face of the press block 66 is adapted to apply a clinching pressure to the insulation lugs 16 and contact lugs 17 and is formed in two parts. The forward part is provided with a cylindrical concavity 71 to conform to the wire insulation and the overlapped lugs 16. The percussion surface 72 for the contact lugs 17 is flat and forms the rear portion of the element 68. Accordingly its engagement with contact lugs 17 produces a flattening of the lugs, which have previously been deflected by crimping plates 38 and 40, as shown in Fig. 10.

The operative faces of the press block 66 are considerably closer to the cross member 58 than the holder 62. The relative locations of the elements are critical because the attachment of the terminal to the wire is achieved in stages. The terminal must be held firmly by the holder so that the deflection and partial clamping of the lugs on the insulation and bare wire effected by the plates and the jaws can occur. The holder therefore must extend below the level of the cam apexes which in turn are required to be placed below the level of the press block 66 so that the plates and jaws can advance to and withdraw from the vicinity of the saddle in substantially the same plane before the descent of the press block.

The operation of the terminal crimping die is as follows: The terminal 14 is placed on the cradle 20 over the pin 22. A conductor is placed in the terminal and between the upstanding lugs 16 and 17. The yieldable holder 62 actuated by the reciprocating guide rods 42 and 44, as by a conventional press mechanism, is then caused to move down over the pin 22 to hold firmly the terminal 14 in position. As the guide rods 42 and 44 travel downwardly cams 52 and 53 supported by the guide rods cause the crimping plates 38 and 40 to slide toward one another and against the jaws 24 and 25 which are caused to crimp the insulation lugs over the conductor insulation, the plates being simultaneously moved against the contact lugs 41 and 41–A which are deflected so as to clamp the bare wire of the conductor. As the guide rods descend further the cams 52 and 53 permit the jaws and crimping plates to separate under spring action so as to allow the press block 66 which is also actuated with the guide rods to apply a clinching pressure to the two pairs of lugs. From the lowermost position of the press block and holder as shown in Fig. 9, the two elements move vertically away from the clamped conductor to return to their initial position, the holder being operative to keep the terminal in position until the plates and jaws have repeated their cycle of operation due to the upward stroke of the guide rods.

It is to be understood that the above description of the preferred embodiment of my invention only and the invention is defined by the following claims and any limitations must be in accord therewith.

What is claimed is:

1. A crimping device for securing a terminal having a pair of opposing insulation lugs and a pair of opposing contact lugs to a conductor comprising a base, a pair of spring biased jaws pivotally attached to said base, the free ends of said jaws being adapted to engage the insulation lugs and urged therefrom by said springs, a pair of longitudinally slidable and spring biased crimping plates supported by the base and adapted to engage said jaws and said contact lugs and being urged therefrom by said springs, reciprocating means disposed in bores provided by said base, said reciprocating means having plate engaging cams adapted to move said plates towards each other so as to pivot said jaws and effect the desired insulation and contact lug deflection, terminal holding means supported by said base, and a cradle mounted in the base between the jaws and proximate said terminal holding means for supporting the terminal in the path of said plates, said jaws having their pivotal axes transversely supported on the base and below said cradle.

2. A crimping device as claimed in claim 1 wherein the cam rises of said plate engaging cams are different whereby the jaws are successively pivoted by said plates.

3. A crimping device as claimed in claim 1 wherein said reciprocating means yieldably supports a holder disposed in a plane below said cams, said holder being adapted to engage said terminal holding means on the downward stroke of the reciprocating means, whereby said yieldable holder and said terminal holding means coact to hold the terminal while its lugs are deflected.

4. A crimping device as claimed in claim 3 wherein a press block is supported by said reciprocating means above the plate engaging cams, said press block being adapted to apply a clinching pressure to the terminal lugs after the deflection of the terminal lugs.

References Cited in the file of this patent

UNITED STATES PATENTS

263,390	Coop	Aug. 29, 1882
1,701,250	Young	Feb. 5, 1929
1,900,695	Curtis	Mar. 7, 1933
2,391,891	Frankel	Jan. 1, 1946
2,449,865	Tanguay et al.	Sept. 21, 1948
2,640,986	Blumensaadt et al.	June 9, 1953