

Nov. 2, 1965

D. G. FALCONER

3,215,973

ELECTRICAL CONNECTOR BLOCK

Filed March 28, 1963

11 Sheets-Sheet 1

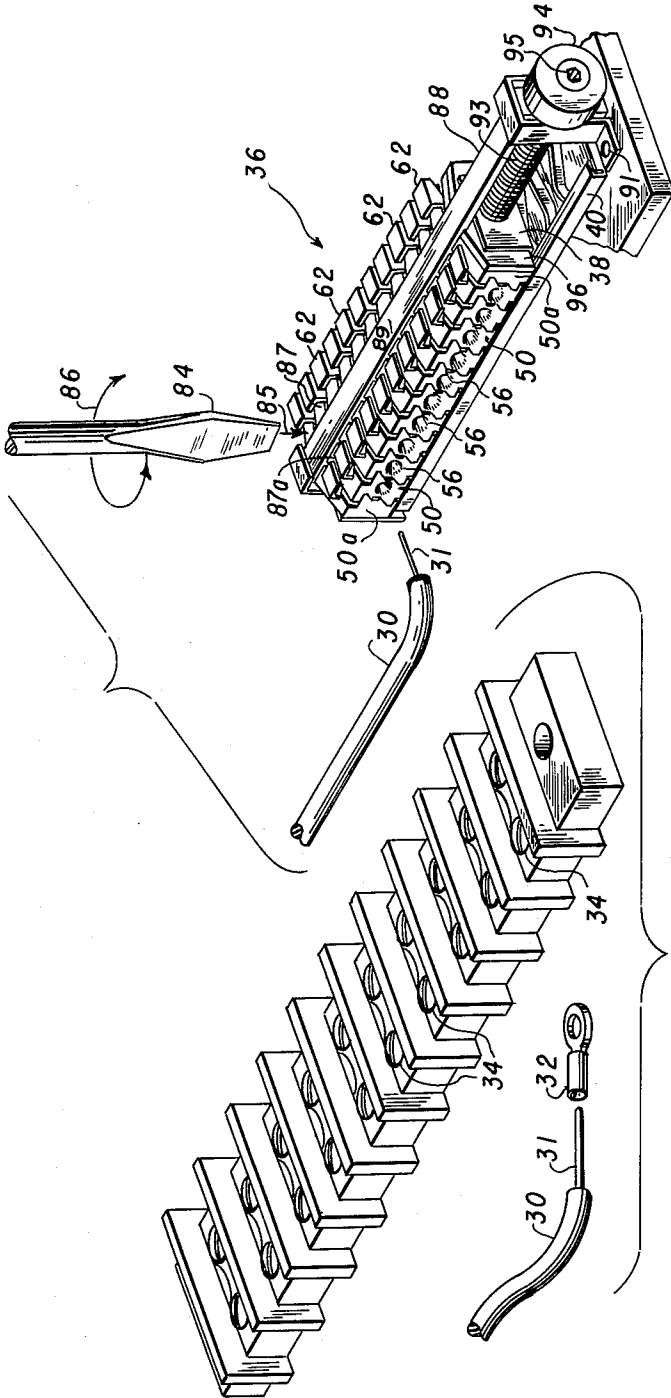


FIG. 2

FIG. 1 - PRIOR ART

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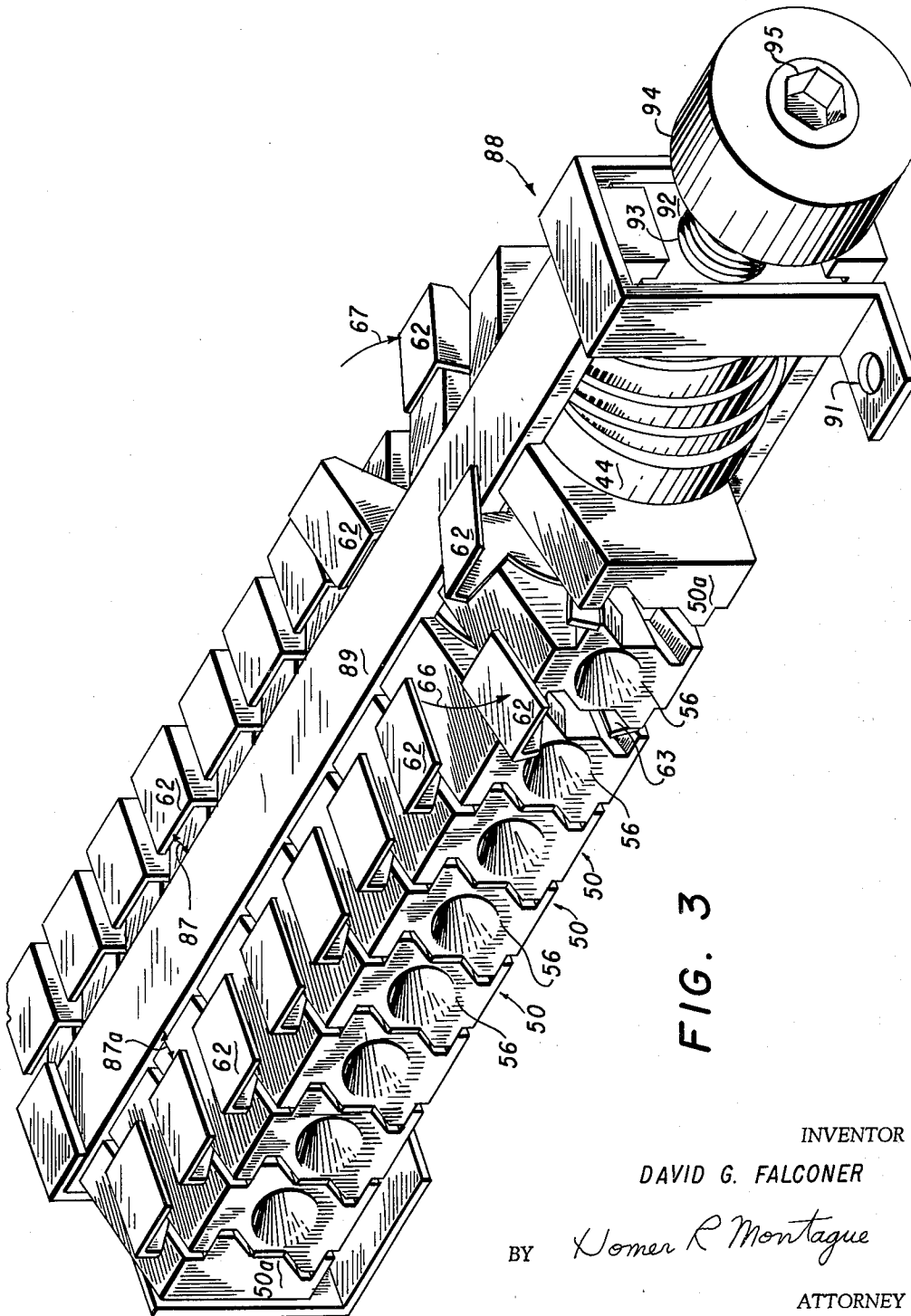
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11 Sheets-Sheet 2



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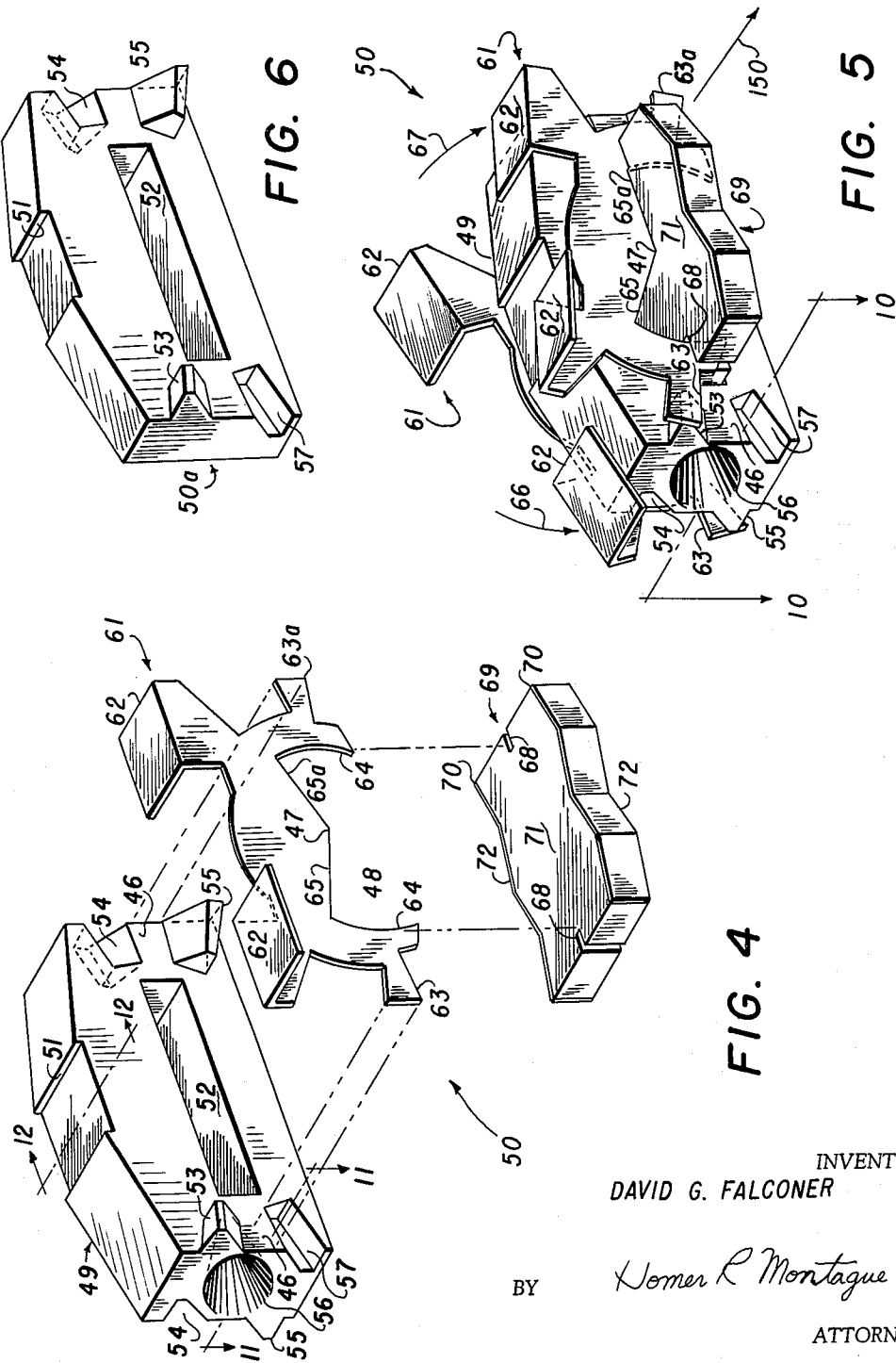
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11 Sheets-Sheet 3



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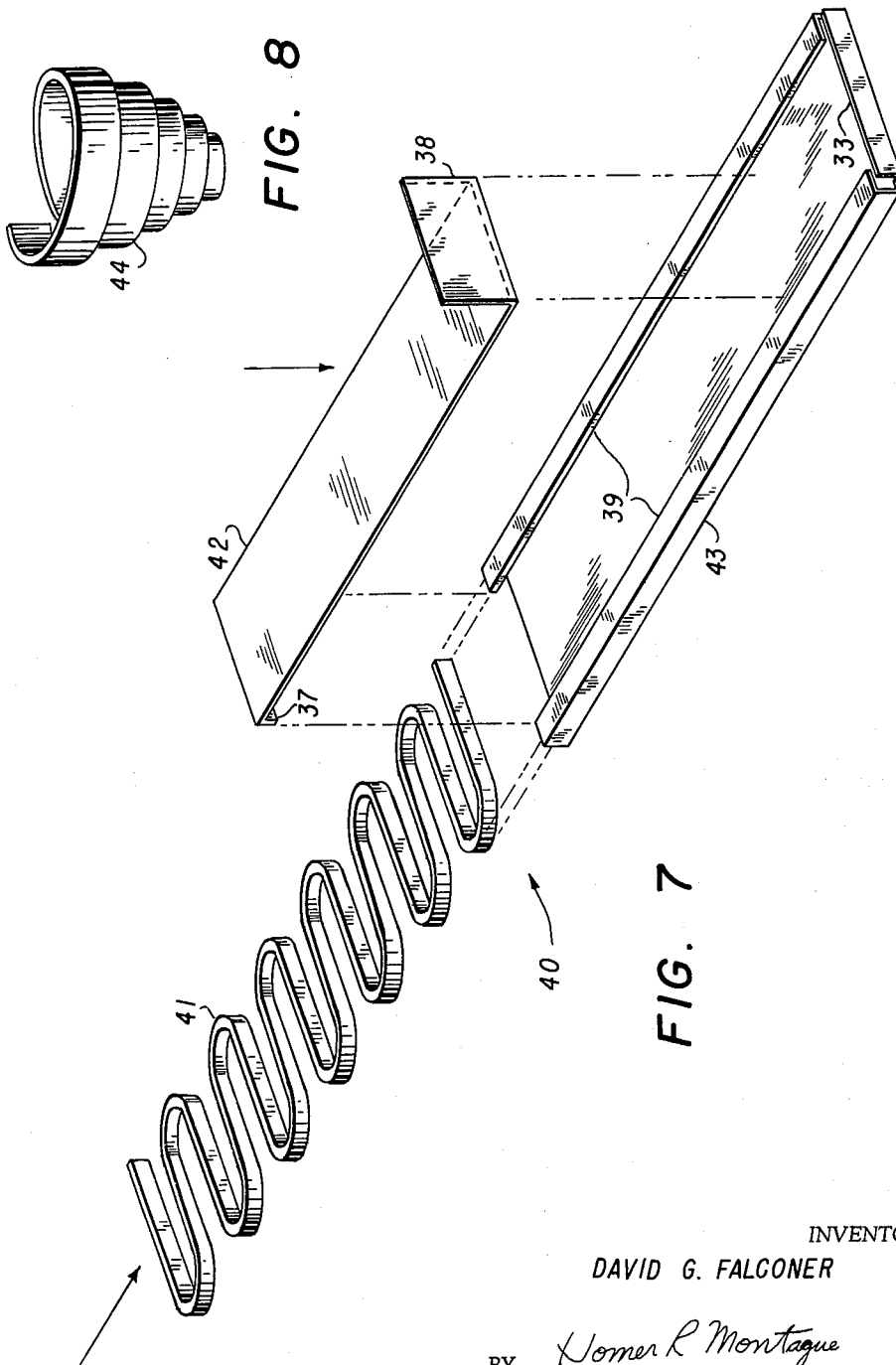
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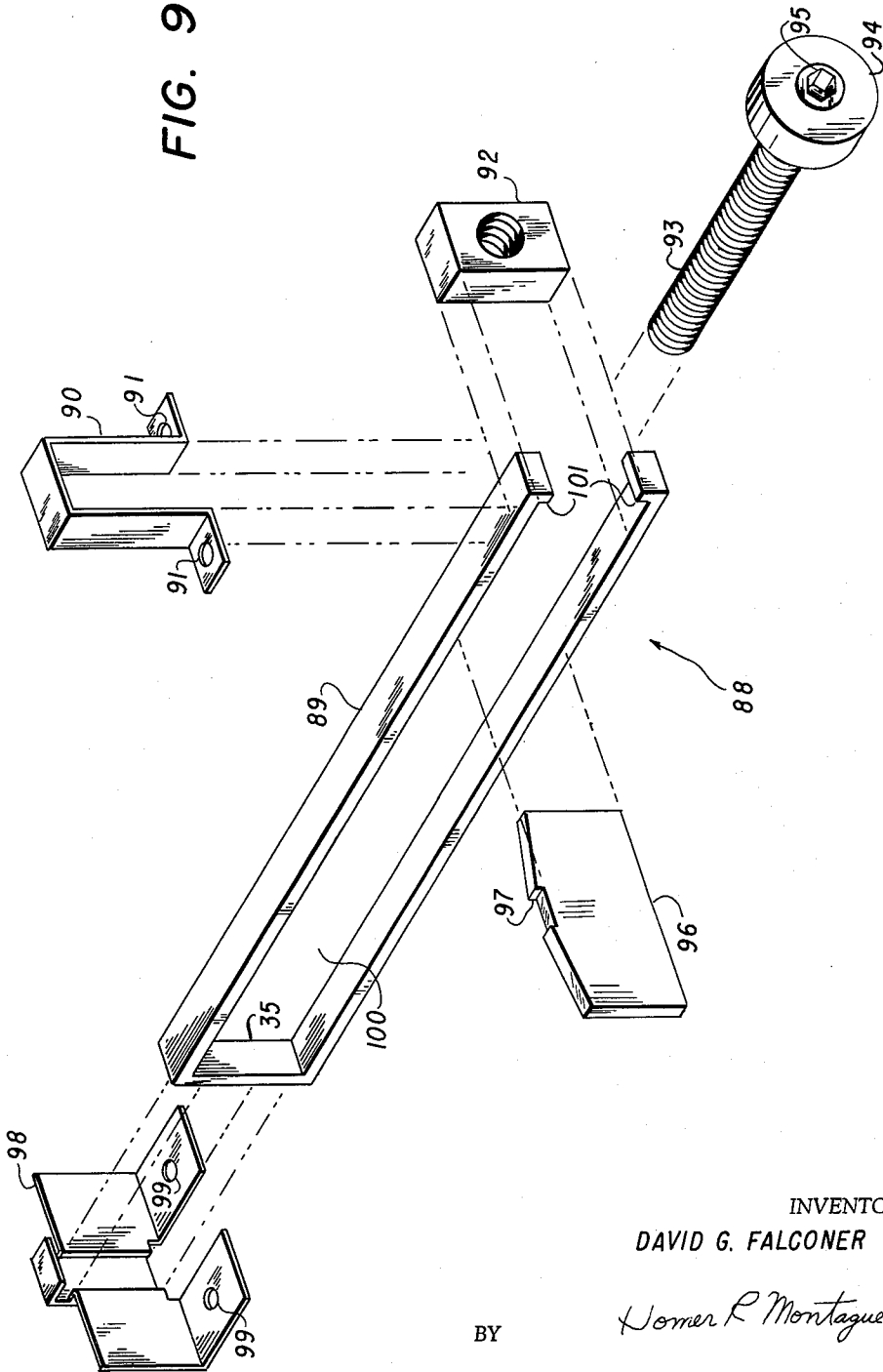
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FIG. 9



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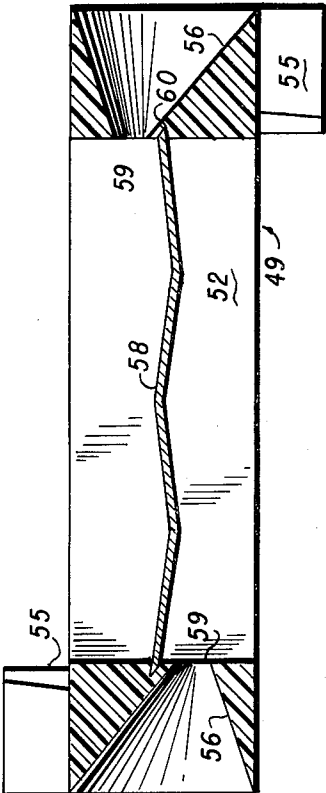


FIG. 11

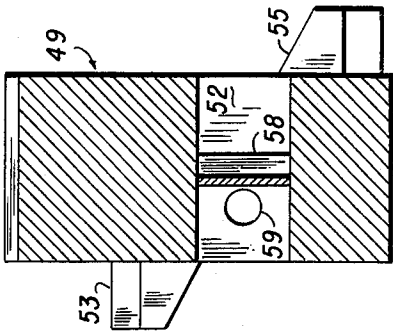


FIG. 12

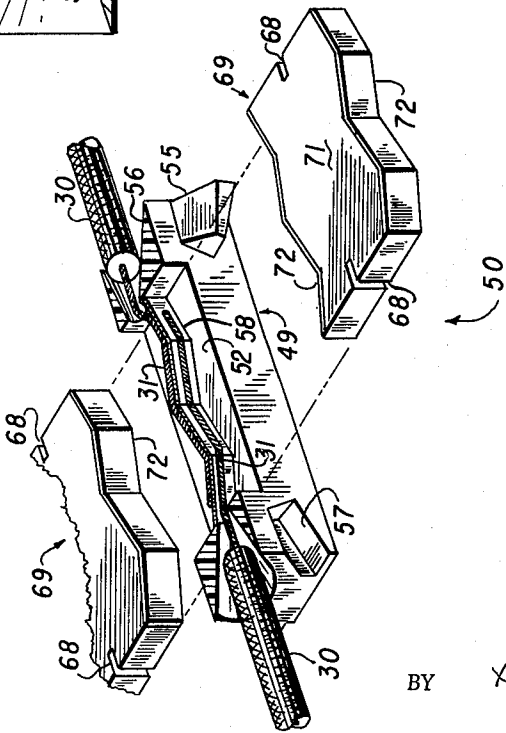


FIG. 10

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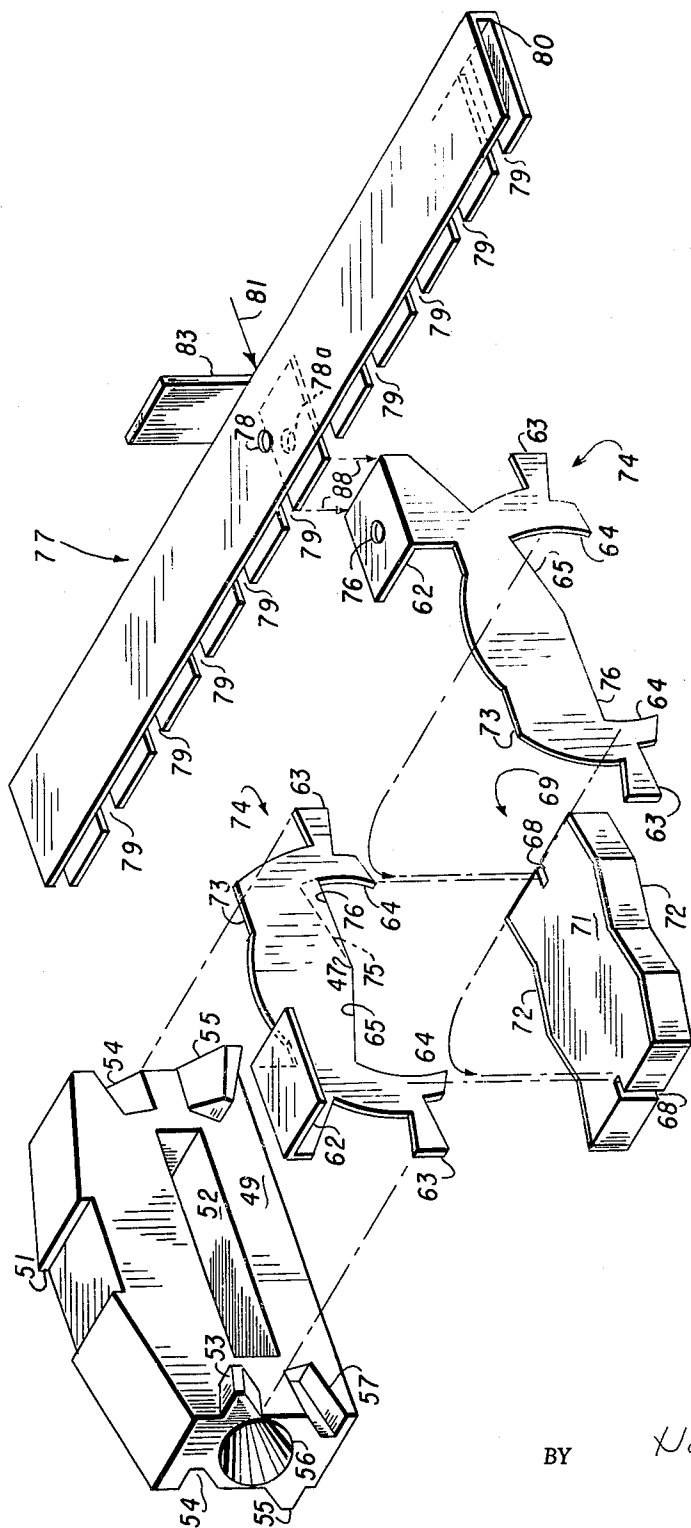


FIG. 13

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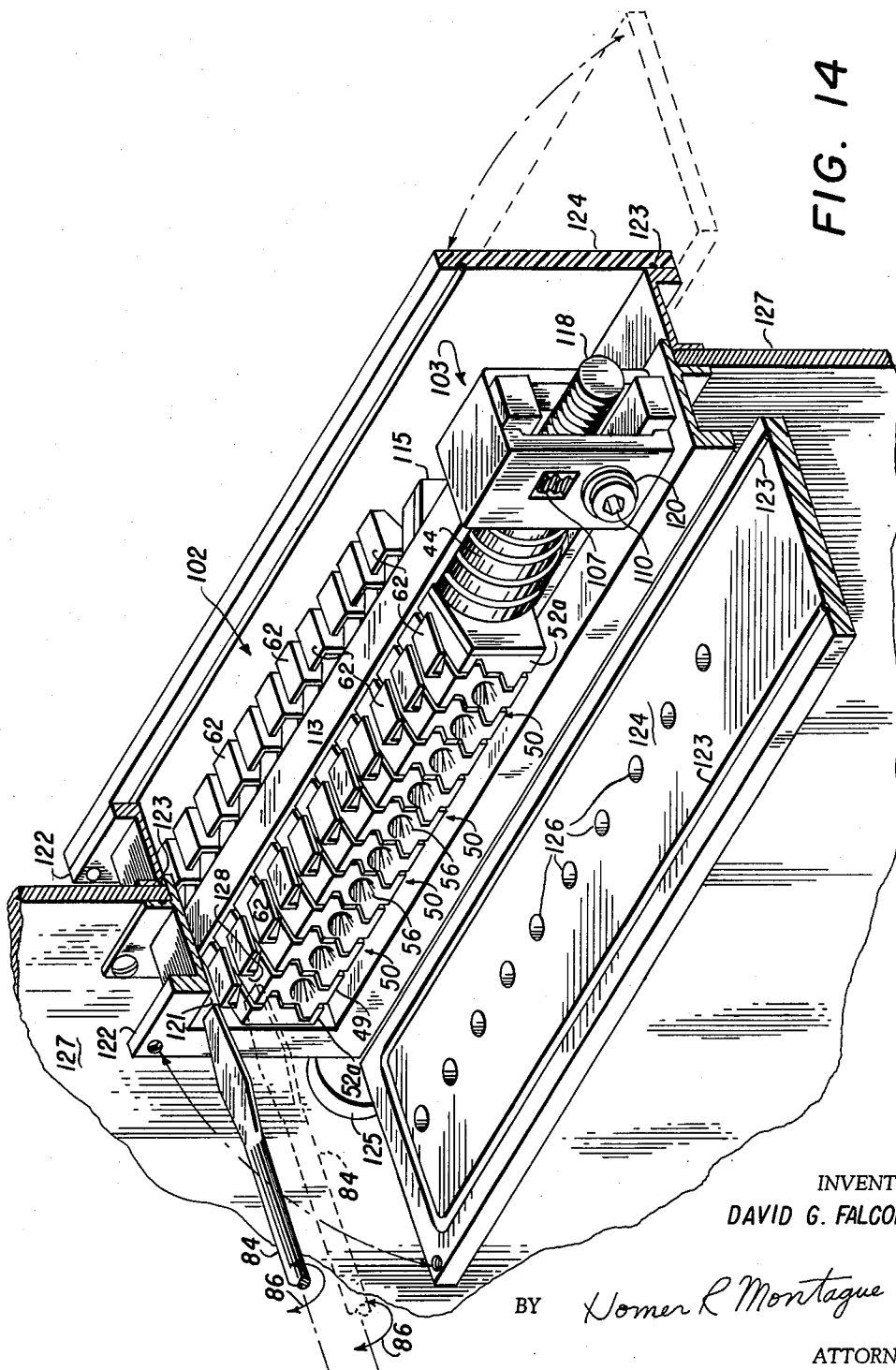


FIG. 14

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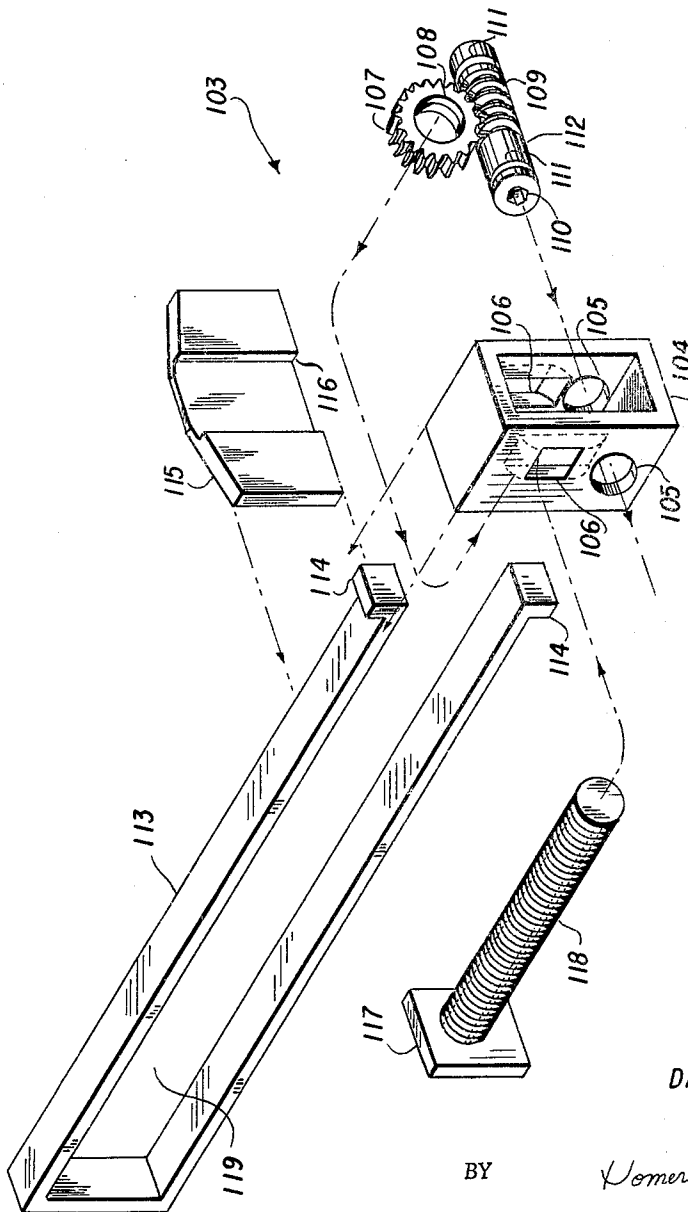
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FIG. 15



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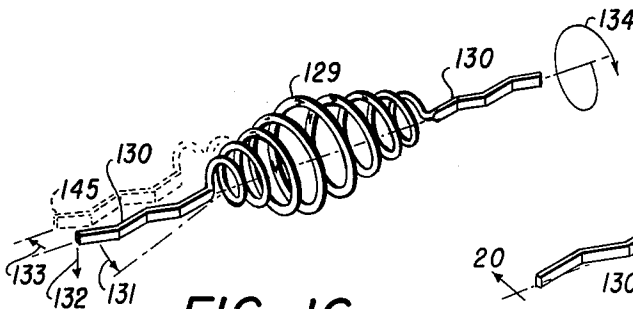


FIG. 16

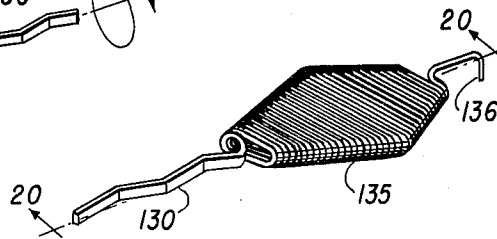


FIG. 17

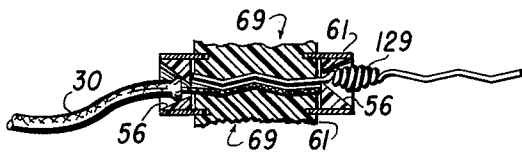


FIG. 18

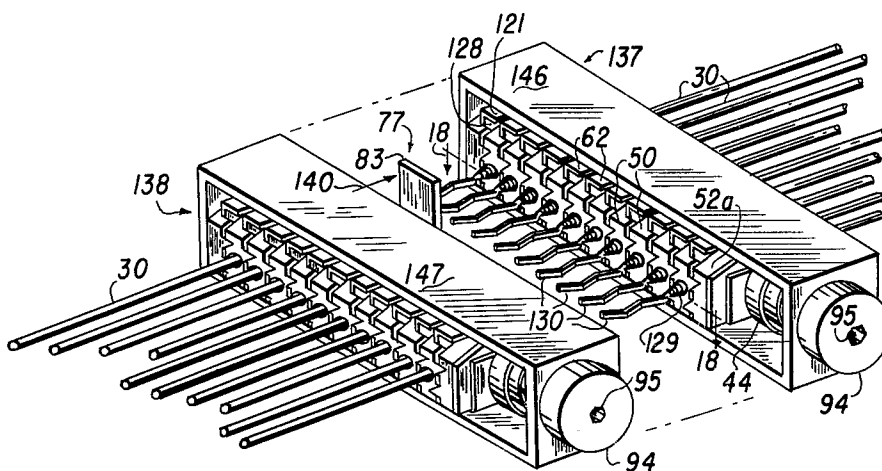


FIG. 19

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FIG. 20

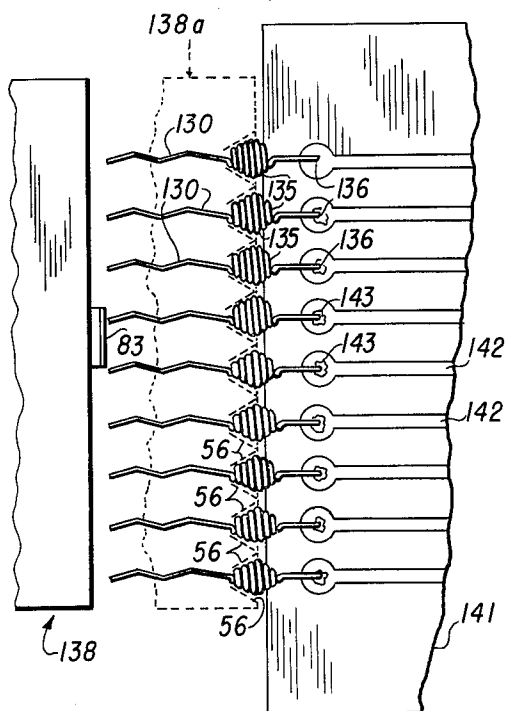
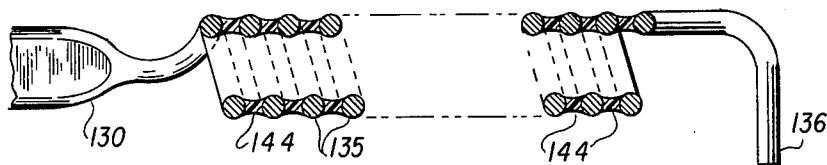


FIG. 21

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3,215,973

ELECTRICAL CONNECTOR BLOCK

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Filed Mar. 28, 1963, Ser. No. 268,634

6 Claims. (Cl. 339-198)

This invention is an improved form of electrical connector and terminal block. In contradistinction to other and previous connectors it has the following principal advantages and objectives:

(1) It requires no special devices such as solder lugs or pins attached to the wire ends. The only wire-end preparation necessary in the use of this invention is that of stripping the wire of insulation; the wire does not need to be straight or prong-like since no resistance to the wire, upon insertion, is encountered such as spring-loaded clamps to be forced apart by the wire itself.

(2) It utilizes a positive opening means for the vise jaws which grip the wire, in the form of a simple key or button for each wire which, upon being pressed, will open the jaws farther apart than the diameter of the wire. After the wire is inserted the key or button may be pressed again, whereupon the vise jaws will be triggered shut, gripping the wire end.

(3) When applied to multiple terminal blocks, the action of opening or closing each vise jaw for each individual wire does not disturb any of the other connections.

(4) A funnel-shaped aperture is provided in conjunction with each pair of vise jaws. This funnel shape not only facilitates the aiming of the wire for the intended connection but in addition, gives support to the covering or insulation of the wire; this action removes the stress concentration which normally results at the point of juncture of an elastic body to a rigid, inelastic one. Breakage of the wire during vibration under service is thus avoided.

(5) Since the individual vise jaws are placed in "Indian file" or "insulated mechanical series," only one fastening screw—and this a much larger screw than heretofore used for individual terminals—is necessary. In addition, a spring means is provided to maintain the vise jaws in a position dictated by the operating keys or buttons previously mentioned.

(6) There is provided an "all or nothing" principle of holding the wires in fast connection. This action results from the fact that the operating keys open the jaws a wider distance than the diameter of the wire; when the keys are pressed to close the jaws, the latter, being forced by a spring means, necessarily close all the way.

In the action of insertion of a wire the wire is jammed into the funnel all the way "to the hilt," that is until the insulated covering wedges into the narrowing of the funnel; the covering of the wire is prevented thus from entering the space between the jaws. In this manner either effective clamping action is made by the jaws which perform the electrical contact, or the jaws, if inadvertently left open, are so wide open that the wire will completely and obviously fall free of its intended connection. This, of course, obviates all doubt as to whether a secure connection has been made.

(7) Because of the unique and peculiar combination of the elements, the keys, the spreading and clamping means described in this disclosure, and the connector and terminal block of this invention can be manufactured as a much smaller and more compact article than customary known products for similar usage.

Other advantages of the invention will become apparent from the following description of certain preferred embodiments of the invention, shown in the accompany-

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ing drawings forming a part of this disclosure, and in which drawings:

FIG. 1 is a perspective view of a conventional terminal block which is placed for comparison alongside a similar view of a typical terminal block of the present invention.

FIG. 2 is a perspective view of a preferred form of the invention.

FIG. 3 is a perspective view of a modified form of the invention of FIG. 2.

FIG. 4 is an exploded perspective view of some principal components of the invention.

FIG. 5 is a perspective view of the components of FIG. 4 in a subassembly relationship.

FIG. 6 is a perspective view of an end block component of the invention.

FIG. 7 is an exploded view of a spring sub-assembly of one species of the invention.

FIG. 8 is a perspective view of an alternative type of spring to that illustrated by FIG. 7.

FIG. 9 is an exploded perspective view of the chassis of one species of the invention.

FIG. 10 is a perspective horizontal sectional view taken along line 10-10 of FIG. 5. In addition to modifying this conventional section by exploding it for clarity, two wires are shown in the relative position they would occupy when actually clamped in place.

FIG. 11 is a conventional section taken along the line 11-11 of FIG. 4.

FIG. 12 is a conventional section taken along line 12 of FIG. 4.

FIG. 13 is an exploded perspective view of certain components of the invention repeated to show their relationship to certain alternative components to those already disclosed by previous figures.

FIG. 14 is a species of the invention adapted to form a sealed wall-type electrical receptacle.

FIG. 15 is an exploded perspective view of the components of FIG. 14.

FIG. 16 is a perspective view of a type of adaptor or auxiliary to the invention.

FIG. 17 is a perspective view of another type of adaptor to the invention.

FIG. 18 is conventional section taken on line 18-18 of FIG. 19 with all parts unnecessary to the understanding eliminated.

FIG. 19 is an exploded perspective view of certain combinations of prior figures forming a male and female connector.

FIG. 20 is a conventional section taken on line 20-20 of FIG. 17.

FIG. 21 is an exploded plan view of a connector of the invention adapted to connect to a printed circuit.

Referring first to FIGURES 1 and 2 of the drawings, one form of the invention in FIG. 2 is compared to the conventional terminal block of FIG. 1 and shows the effectiveness of the invention in miniaturization of the device; the present invention occupies about one-half the cubic space of the conventional article in addition to being simpler to operate and giving better electrical contact. In FIG. 1 the wire 30 to be connected is stripped bare of insulation and joined to a terminal by 32 by either crimping or solder. Screws 34 of the terminal block must then be removed, the lug 32 being fitted into place and the screw 34 replaced and tightened. Where an end terminal is not used, the wire end must be wrapped about the shank of a loosened screw 34.

In FIG. 2 a terminal block of the invention in a preferred form is identified generally by reference numeral 36. A chassis or frame subassembly is indicated by reference numeral 88; this sub-assembly is shown in detail by FIG. 9 in which a U-shaped frame 89 is assembled

with an end mounting plate 98 having mounting holes 99, a generally open space 100 intended to encompass the principal components which will be described later, a threaded member or nut 92 and two prongs 101 which grip the nut. A frame and nut keeper 90 having mounting holes 91 fits over the frame as shown. A hexagon-socket setscrew 93 threads into the nut 92; one end of the set screw bears against a pressure plate 96 which is a rigid metal member the function of which is to protect the plastic components (described later) lying within the space 100 from the high unit pressure of the screw. The other end of the screw is staked onto or carries a hand knob 94. The purpose of using a set screw instead of a cap screw is to provide a very small hexagon socket 95. This small socket acts to discourage the operator from applying excessive torque since he will be unable to turn the knob with a wrench and only the Allen type wrench of the designed torque value will fit. The end mounting plate 98 and frame and nut keeper 90 are fastened to the deck or base upon which the connector is to be mounted.

Referring again to FIG. 2 it will be seen that the space 100 of FIG. 9 is taken up by the following components: two end blocks 50a which are composed of an insulating and readily molded material like nylon. Between these two end blocks are a group of ten sub-assemblies identified by reference numeral 50. Visible in FIG. 2 also are formed keys 62. Lying underneath these sub-assemblies is a spring device 40.

The operation of the species of FIG. 2 may be described briefly now before going into more detail. When it is desired to connect a wire 30, and with screw 93 loosened, a screw driver or some like tool 84 is pressed downward in the direction of the arrow 85 into a space 87 between the keys 62 and the frame 89 and it is then turned in either clockwise or counter-clockwise direction as indicated by the arrows 86. This action with a screwdriver snaps open a pair of vise jaws, hidden in this view. The wire end 31 is then moved into a funnel aperture 56 all the way until the covering of the wire stops when it strikes the narrowing part of the funnel. The screwdriver is then pulled out of the space 87 and placed in a like space 87a on the opposite side from 87; the screwdriver is twisted again until the depressed key 62 returns by spring and cam action to its former position. The wire end 31 is die-formed between the jaws by this action and remains in place without disturbance while the other keys are operated and other wires are connected. After all connections are made the screw 93 is turned in to apply final holding pressure to the vise jaw and wire assemblage.

For an explanation in detail of the block sub-assemblies 50 and the operation of the keys 62, reference should be made to FIGURES 4, 5, 6, 10, 11, and 12. In the exploded perspective view of FIG. 4 a nylon block 49 is formed to contain a funnel 56 for guiding the wire into the clamping area and supporting the wire insulation once the wire is in place; an identical funnel is located on the opposite end of the block 49 but does not show in this view. However, the blocks are symmetrical and therefore an opposite view would appear the same. Cams 53 and 55 are molded integrally with the block 49 and cam recesses 54 and 57 serve respectively to receive the cams 53 and 55 of the identical mating block 49. A retaining depression or groove 51 serves to hold the block 49 in line by engaging the frame member 89. A rectangular hole 52 extends through the block 49. This rectangular hole 52 serves to act as a close-fitting sleeve to two vise jaws, one of which is shown here identified generally by reference numeral 69. The other jaw 69 slides into the rectangular hole 52 from the opposite side.

The jaw central portion 71, FIGURES 4, 5, 8 and 10, is made up of some insulating material such as glass fibers in an epoxy plastic matrix. The vise jaw surfaces 72 are corrugated and are formed of strips of metal 70 bonded to the insulating part 71 of the jaw 69. Guide slots 68 are

located at opposite ends of the jaws and serve to guide the jaw opener 61 by fitting closely around the thin elements 64 of the opener 61. The opener 61 is composed of thin sheet metal hardened for stiffness. The upper part of the opener 61 is formed into two keys 62 bent in opposite directions. The inner surfaces of the elements 64 are a circle, the center of which is congruent with the rectangular center of the jaw 69 when cut by a plane vertically through the jaw in the grooves 68. This configuration allows the opener to rock to the right or left as shown by the arrows 66 and 67 of FIG. 5.

Referring again to FIG. 4, two surfaces or edges 65 and 65a of the opener 61 are slanted at about 15° from a horizontal line 48 which is parallel to the top edge or surfaces of the keys 62. These edges 65 and 65a are of equal length, having their common point of origin 47 on the line 48 and a vertical line passing through the center of the circle formed by the elements 64. Thus the edges 65 and 65a serve as stops for the rocking motion of the opener 62 and the point 47 serves as a pivot which contacts the upper surface of the vise jaw 69. This operation is also visible in FIG. 5 in which the edge 65a is seen stopped by the surface of the jaw while the left edge 65 is rocked or rotated 30° upwards. In FIG. 4 paired cam followers 63 and 63a of the opener 61, when the opener is in horizontal or median position, rest on the surface of the block at 46. When the right-hand key 62 is pressed down all the way, the left-hand cam 63 slides up over the cam 53 while the right-hand cam 63a slides over the cam 55. With the opener 61 in this position it is now moved outward in the direction of the arrow 150 in FIG. 5; since the elements 64 of the opener 61 rest within the narrow groove or tuninion 68 of the jaw 69, the jaw has also been moved outward in the direction of the arrow 150. Meanwhile the block assembly 50 (not shown) on the near side of the above described assembly has maintained the relative position of itself with the jaw 69. Tilting the left-hand key 62 until the edge 65 stops against the surface of the jaw 69 will allow the jaw 69 to remain inward with respect to the sub-assembly 50, shown, but outward with respect to the like next sub-assembly 50 which is not shown. This action is, of course, merely repetitive all along the row of sub-assemblies 50, however many it is desired to have.

The description of the action of the vise jaws 69 to release a wire or admit one will be completed by reference to FIGURES 10, 11, and 12. In FIG. 11 the interior of the rectangular hole 52 is depicted with a septum 58 or fixed jaw plate made of a flat strip of metal corrugated to identical contour with the corresponding metal strips 72 of the jaws 69. The ends 60 of this septum are sharpened, and during assembly into the slot 52 of block 49, the septum 58 is bowed and pressed into the slot until it is properly positioned whereupon it is straightened to the condition shown. Since the block 49 is made of a plastic substance the sharpened ends 60 of the septum will be embedded in place.

In FIG. 10 a pair of wires 30 are shown in place, inserted all the way into the funnels 56 until the wire covering wedges into the narrowing walls of the funnels. The stripped ends of the wires 31 lie along each side of the septum 58; the wires are shown in the die-formed corrugated shape they will be in after they have been pressed between the septum 58 and the jaws 69. The wires are usually round, are often stranded, and in addition to being corrugated by this action they are flattened somewhat, thus increasing their electrical contact area. Note that in FIG. 12 the septum 58 extends from the bottom of the rectangular hole 52 to the top so that there are no crevices into which a wire may become entangled. In both FIGURES 11 and 12 it will be clear that the small ends 59 of the conical funnel are eccentrically located; it will also be apparent that the septum 58 may be made of extremely thin metal, there being only appreciable compressive forces against it.

The jaw elements are urged towards one another by the endwise spring pressure on the array, and each cam separates two of the blocks. Said cam directly engages only one jaw element, as shown in FIG. 4 (at slots 68) and when rotated clockwise (let us say) pulls the jaw element 69 slightly out of the rear block 49 shown in that figure. At the same time, the cam also moves toward the reader the next-forward block (not shown) against the spring force, and the result is the opening of a space within the aperture 52 for reception of a wire-end in passageway 56. But if cam 61 is rotated counter-clockwise (again, in FIG. 4) it will not cam the elements 53, 55 on the block 49 that is shown, but rather the corresponding elements of the next-forward block, those corresponding elements being received in the recesses 54, 57 of block 49. In this case, instead of the cam moving away from the rear block 49 and withdrawing the jaw element therefrom, it will remain flat against the face of block 49 shown, holding the jaw element stationary with respect to block 49; but the forward block (not shown) will be moved in the direction toward the reader, and in effect the said block moves away from the stationary jaw element. The effect is that the counter-clockwise rotation of the cam withdraws the jaw from the next-forward block.

If the septum 59 (FIGS. 10-12) is present, as preferred, it forms a jaw that is fixed with respect to each block, and the moving jaws cooperate with its opposite faces, respectively opening the passageways 56 at the left and right ends of FIG. 11. Any lateral wire-end passage can be opened without loosening the grip on wire-ends received in other ones of the passageways. If the septum is omitted, then the jaw faces of adjacent jaw elements cooperate directly, and wire ends in both passageways of the chosen block will be loosened simultaneously, but again without loosening wires in any other passageways.

The result of devising a structure and combination which will lead the wires with great ease into compact union, the wire ends separated by a thin wall—in most cases only a few thousandths of an inch thick—yet maintaining their insulated and secure condition by the unique structural arrangement of the funnel-shaped apertures, in addition to the thin sheet-metal means for opening and closing the jaws, has made it possible to build a device of such compactness.

The components intimately associated with clamping and holding the wires just described, i.e., the two end blocks 50a, the series of sub-assemblies 50 (as many as required, according to the desired size or capacity of the complete device), are held together by the spring mechanism generally indicated by the reference numeral 40 of FIG. 2 and detailed in FIG. 7 in which 41 is a flat serpentine compression spring prevented from buckling by being retained in a sheetmetal drawer 43, which has a cover 42 fitting on top of the spring 41 and sliding within a track formed between two bent flanges 39 of the drawer 43. An end 37 of the spring cover 42 is bent down to contact one end of the spring 41 while the opposite end 38 of the cover is bent up to bear upon the back-up or pressure plate 96 of FIG. 2 and FIG. 9. This bent end 38 thus encloses the sub-assemblies concerned with gripping the wires, between itself and the opposite, upright part 35 of the chassis or frame member 89 as seen in FIG. 9. The near end of the spring 41 in FIG. 7 is in contact with the bent end 33 of the spring drawer 44. In FIG. 2 the end of the screw is seen in contact with the end 38 of the spring cover 42. Thus the spring assembly 40 supplies the force required to hold in elastic contact all of the previous units involved in gripping the wires according to the dictates of the openers 61, and the screw 93 positively clamps the units together when permanent union is desired.

In FIG. 3 the spring mechanism 40 of FIG. 2 has been replaced by a volute spring 44 surrounding part of screw 93; this spring is shown in greater detail in FIG. 8.

Either one or the other of these springs should be used in all cases in which additional saving of space is a factor for consideration. FIG. 3 in other respects is the same as the species of the invention shown in FIG. 2. In FIG. 3, with the exception noted concerning the spring 44, the same reference numerals appear and the previous description may therefore be followed here.

It will be apparent that because of the extreme compactness of the species of the invention of FIG. 2 and FIG. 3, the keys 62 are perhaps too small to be operated with the finger as a typewriter is operated; it is for this reason that spaces 87 and 87a have been provided to allow for operating the keys (on the smaller size units) with a screwdriver or similar object. It will also be apparent that there is a need for identifying a particular key 62 with a funnel-shaped wire aperture 56 which it serves; a distinguishing mark, on a finished article, should be provided just above the aperture, and the same mark (letter, numeral et cetera) should be placed upon the applicable key.

In FIG. 13 the reference numeral 50b generally refers to the same sub-assembly 50 of FIG. 2 and FIG. 3 with certain modifications which are in some instances desirable. In the species described previously, when it is desired to open a vise jaw corresponding to one wire-admitting funnel (FIG. 11) a key 62 is pressed down until it stops; when it is desired to open a vise jaw corresponding to a diagonally adjacent wire-admitting funnel in that figure, it is required to close the one presently open in order to press down the opposite key. To obviate this necessity the following paragraph describes a modification which makes the operation of each jaw completely independent of any other; a second modification is an attachment for making all or a number of keys dependent upon one key.

Continuing the description of FIG. 13, the block 49 is identical with the corresponding part of FIGURES 2 and 3. In place of the opener 61 previously described are two openers generally indicated by the reference numeral 74 which are identical to each other but are faced or oriented in opposite directions. The openers 74 differ from the openers 61 of previous description in the following respects: the key 62 has been sheared off on one side of the part at 73; the dotted line 75 is located in this figure where edge 65a is in the previous FIGURES 4 and 5. The edge 76 in FIG. 13 is located 15° lower than the corresponding edge 65a of FIGURES 4 and 5 and will therefore prevent the opener 74 from rocking needlessly in both directions. In other respects than these, openers 74 are identical with the openers 61. In this sub-assembly 50b one opener controls one jaw while the other placed adjacent to it and sliding in the same trunnion 68 controls another jaw so that independent jaw operation is effected. In the remainder of sub-assembly 50b a master key 77 is shown which consists of a channel 80 having slots 79 placed in the lower channel element, the slots 79 having width enough to permit the upright portions of all the openers 74 to fit in them and still have room enough for the openers 74 to move laterally as their cam followers 63 and 63a rise over the cams 53 and 55.

A thumb lever 83 protrudes upward from the channel 80 as a convenient means of operation. A hole 78 and 78a is provided through both elements of the channel and a mating hole 76 may be provided in one key 62. To assemble, the channel 80 may be dropped down in the direction of the arrows 82 until the key 62 is in alignment with the vertical middle of the channel 80 whereupon the channel may be advanced in the direction of the arrow 81 and bolted or riveted to the key 62.

In FIG. 14 in which the invention is adapted to a wall plug, reference numeral 102 generally refers to the components 52a, the sub-assemblies 50, and the spring 44 which are identified in FIG. 3. In addition to these components and alternative chassis or frame assembly 103 has been substituted for the corresponding chassis assembly 88

of FIG. 3; a housing 122, having cover plates 124, sealing rings 123, a hinge 125 for the cover, and holes 126 for entrance of wires have been added. The chassis assembly 103 is fastened by some convenient means, not shown, in the interior of the housing 122. The operation of this species is similar to that of FIG. 2 and FIG. 3. To depress the keys 62a screwdriver 84 is inserted into the space 121 existing between the housing 123 and the key 62; the screwdriver is then turned in the direction of the arrows 86. To return the key 62 the screwdriver is inserted below the key into the space 128 which exists between the key 62 and the top of the block 49; the screwdriver is then twisted as previously described. Tightening or loosening of the screw 118 for final locking of the clamping action on the wires is accomplished by inserting an Allen wrench into the socket 110 and turning.

For a description of the chassis assembly 103 and operation of the screw 118 reference should be made also to FIG. 15 in which a U-shaped metal frame 113 for embracing the clock assemblies 50 and other components in the area denoted by reference numeral 119, and which is formed at the near ends with outward turning prongs 114 which retain a gear housing 104, when they are sprung inward, slipped through the gear housing 104 and are then allowed to spring back out. The gear housing 104 contains two in-line worm shaft bearings 105, and two in-line milled rectangular openings 106 which retain a worm gear 107 in axial position for engaging the worm 109 when the worm shaft 112 is fitted into the bearings 105. The worm shaft contains two grooves 111 for receiving snap rings; one of the snap rings is identified by reference numeral 120 in FIG. 14. The opposite snap ring is hidden from view in FIG. 14. A hexagon socket 110 is broached all the way through the worm shaft 112 so that access to it with an Allen wrench may be had from both ends of the shaft. The worm gear 107 is threaded in its bore 108, these threads mating with the screw 118. The screw 118 has a square head 117 which fits into the slot 116 of the pressure plate 115. The pressure plate fits snugly in between the arms of U-shaped frame 113, hence the screw 118 is prevented from turning as the worm gear 107 is driven by the worm 109. The screw 118, therefore, moves in to apply pressure to clamp the wires or out to release pressure according to the turning of an Allen wrench in the socket 110.

In FIG. 16 a double-coned helical spring 129 is formed at both ends into stems 130 which conform in corrugations to mate with the corrugations of the vise jaws 69 previously described. The usefulness as an accessory to the invention can be seen in FIG. 18 in which a wire 30 is shown clamped in place and the stem 130 is clamped in electrical contact with it; and in FIG. 19 in which a row of ten stems 130 become the prongs of a male connector 137. Referring again to FIG. 16, the arrow 133 shows the lateral displacement of the stem 130 permissible, the dotted lines 145 representing the displaced stem 130. The arrows 132, 131, and 134 show the other permissible departures from true center position of the stems 130. The purpose of this accessory is to provide connector prongs which permit a certain amount of dimensional tolerance in spacing and alignment between the male connector and the female connector.

In FIG. 19 male connector 137 consists of a rectangular housing 146 enclosing the principal components of FIG. 2 and FIG. 3. In addition the compliant stem device 130 of FIG. 16 is shown installed in a row of the stems. Spaces 121 and 128 are provided as in FIG. 14 for operating the keys 62 to install or remove a stem, and on the back of the connector where the wires 30 connect, a similar provision is made. A female connector 138 is shown in which a rectangular housing encloses the same components as the male connector just described with two exceptions, as follows: the keys 62 (not visible in this view) on the mating side of the connector have been supplemented by the master key 77 described in FIG. 13, the finger knob 83 of

which can be seen protruding into view. To connect the male connector 137 with the female connector 138 the finger knob is pressed in the direction of the arrow 140; this opens all of the apertures 56 (not visible in this view) an ample distance whereupon the two connectors may be brought together. The finger knob 83 is then returned to its former position upon which action the vise jaws 69 will snap closed upon the stems 130.

The same principle illustrated in FIG. 16 is illustrated in FIG. 17 in a different form adaptable to use when it is desired to connect the female connector 138 of FIG. 19 to a printed circuit. In FIG. 17a stem 130 of identical configuration to that of FIG. 16 is formed integrally with a double coned, flattened, helical spring 135 and ending in an L-shaped stem 136 at the opposite end.

In the sectional view of this spring adaptor, FIG. 20, means for damping out the resonance of this adaptor is shown which consists of filling the interstices of the coils with a semi-solid silicone rubber webbing 144; this may be accomplished by dipping, and is applicable to the similar double-coned spring 129 of FIG. 16.

In FIG. 21 a group of nine of the spring adaptors 135 of FIG. 17 are shown with their ends 136 inserted into holes and soldered at 143 to the printed circuits 142 of the printed circuit board 141. The female adaptor 138 of FIG. 19 is shown about to be joined to the printed circuit 142 and is shown by the dotted lines 138-a in the position which is assumed when union is effected. Note that the funnel-shaped apertures 56 of previous description completely envelop the conical portion of the spring adaptor 135. As stated in the description of FIG. 19, considerable dimensionable variation in spacing and alignment of the stems 130 can be absorbed by this arrangement. The operation required to open the vise jaws, by pressing on the finger knob 83, was described also in connection with FIG. 19.

When used as a terminal block only, for example in the form shown as a whole in FIG. 2, the device will ordinarily be bi-lateral, in the sense that wire-end receiving apertures are provided along both of the two opposite lengthwise sides of the device. This permits a pair of wire-ends to be connected to one another while maintaining isolation between that pair and the adjacent pairs in other sets of apertures. However, the device may also be one-sided, in the sense that the apertures along one lengthwise side are available for connection to the wire ends, and connections along the opposite lengthwise side may be made to a circuit board, permanent wiring or the like. When the construction is bi-lateral, the presence of septum-jaws such as at 58 in FIG. 11 permits the individual wire-ends on opposite sides to be removed individually, without danger of inadvertent removal of the corresponding wire-end on the other side. If this feature is not required, the septum plates may be eliminated without departing from the principles of the construction.

The provision of a resilient end-wise clamping force, as by the springs 41 and 44 in FIGS. 7 and 8, in addition to a positive end-wise clamping force, as by the screw clamps, also aids in preventing accidental loosening or removal of a wire-end when a different wire-end is being inserted or removed. The positive clamp absolutely ensures against loss of a connection, even under conditions of high shock forces or vibration. As will be understood, the use of an inherently "irreversible" screw clamp is a convenient and economical way to provide such positive clamping, but other positive clamp arrangements could also be employed.

What is claimed is:

1. An electrical terminal connection device comprising a framework, a plurality of blocks slidably arranged in a linear array in said framework and secured by said framework against motion other than in the lengthwise direction of said array, said blocks being apertured in the direction of said array to define a common lengthwise passageway therethrough, and the adjacent surfaces of said

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blocks being formed with cooperating cam formations extending in the general direction of said array, each of said blocks having at least one outwardly opening transverse passageway communicating with its respective aperture to receive wire-ends therein; a plurality of jaw elements fitted within the apertures of said blocks and shaped for sliding non-rotary motion in the lengthwise direction of said lengthwise passageway, said jaw elements being dimensioned to span the spaces between adjacent blocks and substantially filling said lengthwise passageway; a plurality of flat cam-operating devices interposed respectively between adjacent pairs of said blocks and being connected with said jaw elements and operable to separate, through cam action, any selected pair of such blocks and concurrently to withdraw the corresponding jaw element partly out of the aperture in one block of said pair, to permit insertion of a wire-end in the corresponding transverse passageway thereof and into said lengthwise passageway in the path of said partly withdrawn jaw element; and means for resiliently urging the first and last of said jaw elements towards one another to maintain all of said jaw elements in a tightly compressed linear array subject to the separating action of said cam-operating devices.

2. A device in accordance with claim 1, including positive, irreversible clamping means for compressing said jaw elements towards one another and in gripping relation to any intervening wire-ends.

3. A device in accordance with claim 1, in which each of said jaw elements has its end faces within the blocks transversely zig-zag in profile to correspondingly shape a wire-end engaged by said face.

4. A device in accordance with claim 1, and a fixed transverse jaw plate carried by each of said blocks mid-

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way of its aperture, for cooperation with the end faces of the jaw elements entering said block; there being a pair of said transverse passageways disposed on opposite sides of the transverse plane of said jaw plate.

5. A device in accordance with claim 1, in which the outer end of said transverse passageway is funnel-shaped to guide an approaching wire-end thereinto.

6. A device in accordance with claim 1, and means for concurrently operating a plurality of said cam-operating devices.

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