

Sept. 16, 1952

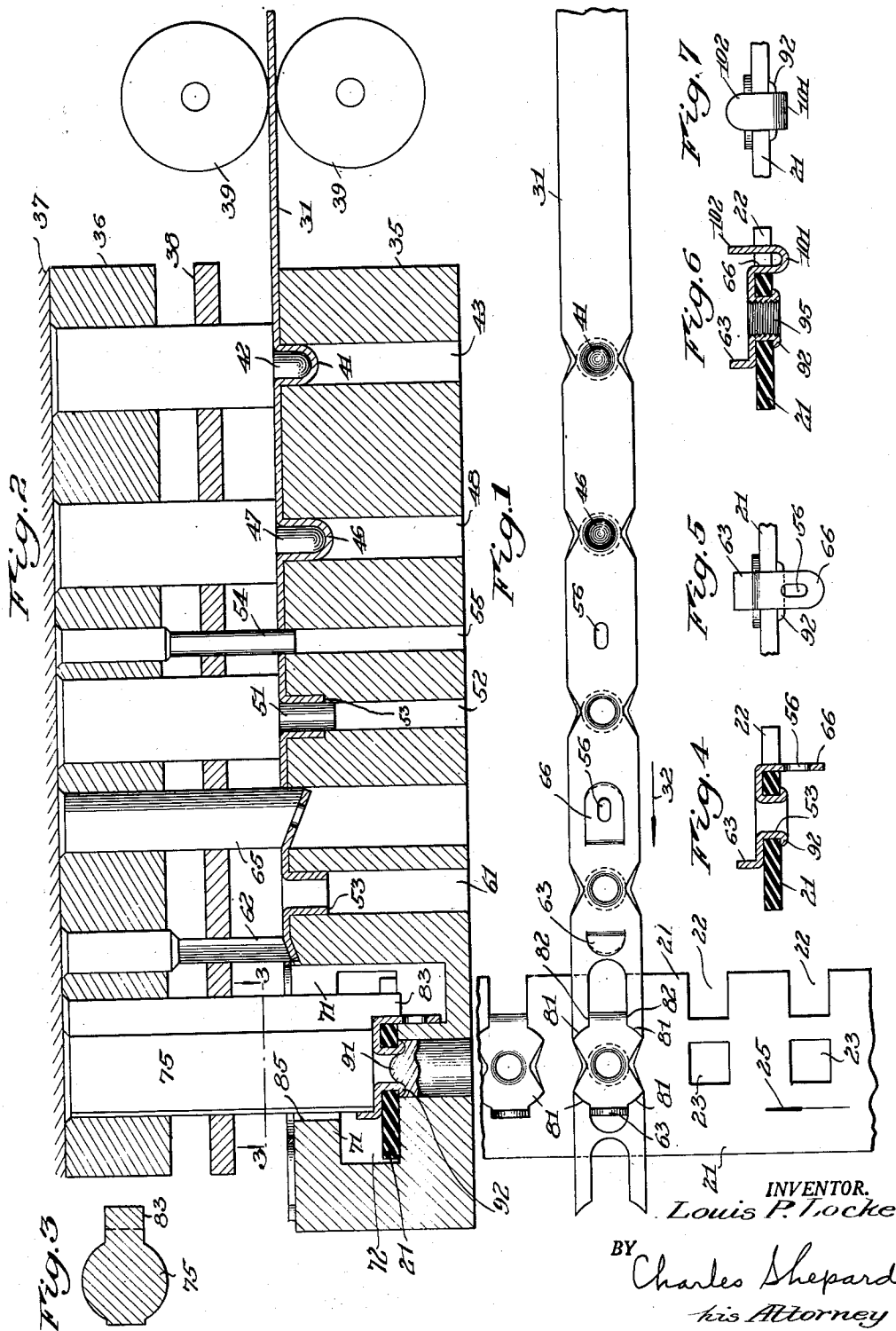
L. P. LOCKE

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METHOD OF MAKING ELECTRICAL TERMINALS

Filed June 10, 1947

2 SHEETS—SHEET 1



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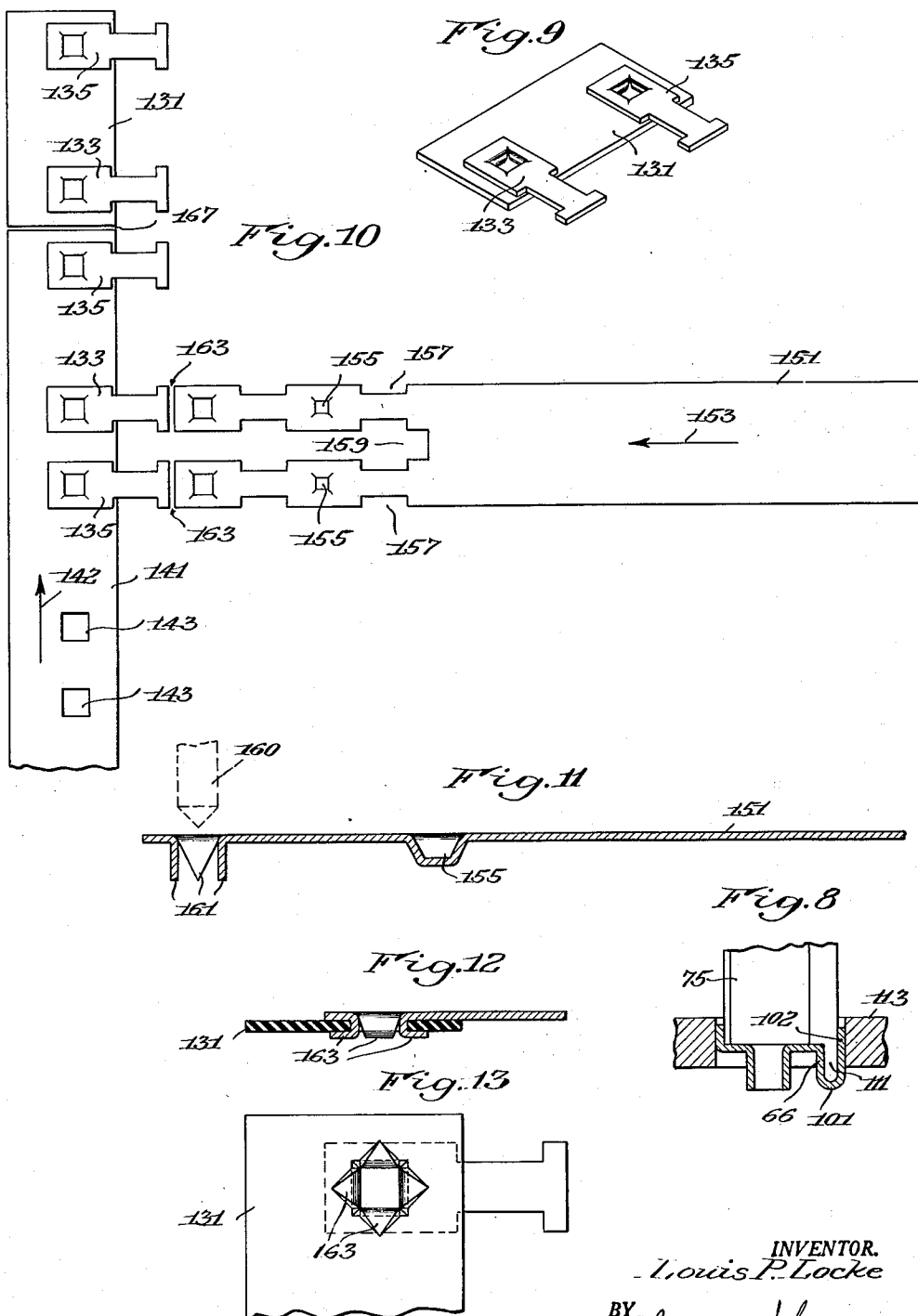
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2 SHEETS—SHEET 2



INVENTOR.
Louis P. Locke
BY Charles Shepard
his Attorney

UNITED STATES PATENT OFFICE

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METHOD OF MAKING ELECTRICAL
TERMINALS

Louis P. Locke, Victor, N. Y.

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9 Claims. (Cl. 29—155.55)

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The present invention relates to an electrical terminal or connector such as is used in making connections of electric wires in various kinds of electrical apparatus, and to a method and apparatus for making such a terminal or connector.

An object of the invention is the provision of a generally improved and more satisfactory method of making terminals and connectors of this type, and particularly of a method which is more speedy, efficient, and economical than prior methods.

Another object of the invention is the provision of a method of manufacture which can be carried out readily without the use of special and expensive apparatus.

Still another object is the provision of simple, efficient, and inexpensive apparatus for making electrical terminals.

Still another object is the provision of an improved and more satisfactory terminal or connector.

A further object is the provision of a terminal or connector so designed that it may be made more quickly, easily, and economically than the comparable terminals or connectors of the prior art.

A still further object is the provision of a simplified form of electrical terminal or connector which has adequate provision for mounting the metallic part rigidly upon the insulating part and adequate provision for holding an electric wire in place for a soldering operation, while nevertheless being substantially simplified as compared with prior terminals and connectors of the same general type.

These and other desirable objects are accomplished by the construction disclosed as an illustrative embodiment of the invention in the following description and in the accompanying drawings forming a part hereof, in which:

Fig. 1 is a diagrammatic plan of a metallic strip being fed in one direction and an insulating strip being fed in another direction, illustrating both the method of manufacture and the construction of the article;

Fig. 2 is a diagrammatic vertical section taken longitudinally along the metal strip, showing also the punches and dies used in the manufacturing operation;

Fig. 3 is a horizontal section taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is a vertical section through one form of electrical terminal according to the present invention;

Fig. 5 is a front elevation of the same, with parts broken away;

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Fig. 6 is a view similar to Fig. 4 showing a modified form of construction;

Fig. 7 is a front elevation of the construction shown in Fig. 6 with parts broken away;

Fig. 8 is a diagrammatic vertical section through a modified form of punch and die used in manufacturing the construction shown in Figs. 6 and 7;

Fig. 9 is a perspective view of another modified form of construction;

Fig. 10 is a diagrammatic plan illustrating the steps of manufacturing the construction shown in Fig. 9;

Fig. 11 is a fragmentary vertical section through one of the metal strips shown in Fig. 10, further illustrating the manufacturing steps;

Fig. 12 is a vertical section through the completed article shown in Fig. 9, the section being taken longitudinally along the center line of one of the metal strips; and

Fig. 13 is a bottom plan of a portion of the construction shown in Fig. 9.

The same reference numerals throughout the several views indicate the same parts.

Electrical terminals or connectors of the type here dealt with consist in general of a strip of insulating material, such as fibrous material or resinous or plastic material, and one or more metallic members mounted on the strip of insulating material. Usually at least two metallic members are mounted on the insulating strip, and sometimes a considerable number of metallic members are mounted on the same insulating strip. These insulating strips are used by manufacturers of electrical equipment, being mounted in the electrical equipment and serving to hold the ends of various electric wires while the wires are being connected to each other, the wires in most cases being soldered to the metallic members, usually two or more wires to each metallic terminal. The assembly of the electrical equipment (such as a radio set, for example) is greatly facilitated by the use of terminals of this kind, as is well understood in the art.

The problem involved is to assemble the metallic members in the required number and at the required spacing on the insulating member or strip, with the greatest possible economy of separate steps in the manufacturing operation of placing the metal member on the insulating member, while at the same time anchoring the metal member firmly to the insulating member so that it will not later come loose, and so that it will provide easy and convenient attachment for the wire or wires which are to be connected to the metal member. In most of the comparable ter-

minals of the prior art, it is necessary to fasten the metal member to the insulating member at two spaced points, in order to anchor the metal member sufficiently firmly to prevent it from turning on the insulating member; or else, it is necessary to perform two separate operations in placing the metal member on the insulating member, to prevent relative rotation of the parts. According to the present invention, the metal member is fastened to the insulating member in a single operation or a single step, at one point only rather than at two spaced points, yet the connection between the parts is sufficiently rigid to prevent relative rotation or loosening of the metal member from the insulating member.

According to one form of the present invention, as illustrated particularly in Figs. 1 to 5, inclusive, there is provided a strip 21 of insulating material such as fiber, resin, plastic, et cetera, which, in any suitable manner, is provided at proper intervals with a series of notches 22 and openings 23; one of the openings being opposite each notch 22, as seen in Fig. 1. The strip 21, thus notched and perforated, is fed intermittently or step by step into a punch press, the feeding being in the direction of the arrow 25.

A strip of suitable sheet metal, such as copper, is indicated at 31 and is fed into the press in the direction of the arrow 32, in overlying relation to the insulating strip 21 and substantially at a right angle thereto. The metal strip 31 is subjected, as it travels intermittently step by step, to the action of certain punches and dies mounted in the punch press. On the bed of the press is a compound die indicated in general by the numeral 35, and a series of punches are held in the punch holder 36 mounted on the platen 37 of the press. A stripper plate 38 may be employed to strip the metal from the punches after each punching operation. Any suitable feeding means is employed, indicated diagrammatically by the feeding rollers 39.

Taking up the successive operations performed on the metal strip in order, the first operation is the making of a shallow draw 41 in the metal strip by means of the draw punch 42 moving into the die opening 43. Then the strip of metal is fed forward one step, so that the shallow drawn part 41 is aligned with the next punch, and a deeper draw 46 is formed by the punch 47 entering the opening 48 in the die. Next, the metal strip is advanced one more step so that the deeply drawn part 46 is aligned with the punch 51 which comes down through the deep draw into the die space 52 and cuts out the bottom of the deep draw, to form a tubular boss or eyelet portion 53. Simultaneously therewith, the punch 54 enters the opening 55 in the die and punches out the small slot or hole 56 in the metal strip.

Then the strip 31 is fed forward one more step, whereupon the tubular boss 53 enters the opening 61 in the die, and the punch 62 cuts the curved end of the tab 63 to the left of the boss 53, while the punch 65 cuts the tab 66 around the hole 56 and turns this tab partly downwardly. The tabs 63 and 66 are not severed from the main body of the strip.

Then the metal strip is fed forwardly one more step to its final position in which it rests on what may be called an overhanging die or undercut die, having overhanging portions or ledges 71 which support the metal strip, and a lateral or crosswise opening 72 through the die below the level of the metal strip, in which opening 72 the insulating strip 21 lies crosswise of the metal strip.

A punch 75, having the special shape best shown in Fig. 3, comes down into the overhanging die and severs the individual terminal from the main body of the metal strip 31 along the right hand set of arcuate lines 81 and the straight lines 82 shown in Fig. 1, at the same time severing a scrap piece from the terminal along the left hand set of arcuate lines 81. A lateral and longitudinal extension 83 on the punch 75 first hits the tab portion 66 of the terminal just before the terminal is cut loose from the main body of the metal strip, and bends this tab portion downwardly at a right angle, as seen in Fig. 2. Then, just about the time that the downward bending of this tab 66 is completed, the main body of the punch 75 severs the terminal from the rest of the strip 31 along the cutting lines 81 and 82 and pushes it downwardly through the overhanging die, and during this downward pushing of the terminal, the tab 63 is forced by the overhanging part of the die to bend upwardly to a vertical position, and it slides down past the surface 85 of the die while maintaining its upstanding or vertical position. At the time that the punch 75 comes down, the insulating strip 21 is positioned in the opening 72 of the die in such position that one of the notches 22 and one of the holes 23 are directly below the punch 75. The punch carries the now severed terminal downwardly onto the insulating strip 21 in such position that the downturned tab 66 of the terminal enters the notch 22 and simultaneously therewith the boss or eyelet portion 53 enters the hole 23 of the insulating strip. As the punch continues its downward movement it forces the lower end of the boss 53 against the clinching anvil 91 which curls the bottom edge of the boss or eyelet 53 outwardly to clinch it over the lower surface of the insulating material 21, as seen at 92 in Figs. 2 and 4.

Those skilled in the art will readily understand from the foregoing description that although several stages or steps are necessary in the production of the electrical terminal, they are all performed in unison by one stroke of the press, upon successive portions of the metal strip 31, so that there is, in effect, only a single step or operation in manufacturing the terminal from the metal strip. After once the press has been set into operation and the advancing end of the metal strip 31 has been fed forwardly past the successive punches, each cycle of operation or stroke of the press thereafter completes the manufacture of one of the electrical terminals and the placing or anchoring thereof on the insulating strip. In other words, the punch 42 is performing the first operation on one part of the metal strip 31 at the same time that the punch 47 is performing the second operation on another part of the strip, and at the same time the punches 51 and 54 are performing the third operation on another part of the same strip, and at the same time the punches 62 and 65 are performing the fourth operation on another part of the same strip which has previously had the first, second, and third operations performed thereon, and all this occurs at the same time that the punch 75 is performing the fifth or final operation on still another part of the same strip, which other part has previously had the other four operations performed on it.

The notch 22 in the insulating strip 21 is just wide enough to receive snugly the downturned end of the tab 66. Hence the engagement of this tab or ear 66 in the notch 22 will prevent

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the terminal from turning on the insulating strip, notwithstanding the fact that the terminal is actually fastened to the strip only at one point rather than at two spaced points. Thus the clinching or riveting of the tubular part 53 of the terminal, as indicated at 92, is entirely adequate to anchor the terminal firmly on the insulating strip, in view of the engagement of the part 66 in the notch 22.

The fact that the tab 66 is turned down substantially simultaneously with the riveting or clinching of the terminal onto the insulating material, is one of the noteworthy features of this invention. In the comparable terminals of the prior art, it has usually been necessary to turn down any tab similar to the tab 66, as a separate and distinct operation after the metal member has been fastened to the insulating member. This separate operation is entirely avoided according to the present invention, due in large part to the special construction of the overhanging die and the special punch which turns the tab down simultaneously with the severing of the terminal from the metal strip of which it is made, and which, in a subsequent part of the same stroke of the press, rivets or clinches the terminal onto the insulating strip.

Production of these terminals is extremely rapid, for all that is necessary is to feed strip 31 of raw metal stock into the machine through the feeding mechanism 39, in one direction, and to feed the strip 21 of insulating material, previously punched and notched at proper intervals, into the machine in another direction at right angles to the feed of the metal strip, and it is even possible, if desired, to form the notches 22 and holes 23 on the same press, concomitantly with the formation of the metal parts. There issues from the machine a long strip of the insulating material with a series of electrical terminals fastened properly thereto, one at each hole 23 and notch 22. The completed strip of insulating material with terminals thereon may then be cut at appropriate intervals to provide insulating strips of the desired length with the desired number of terminals for any desired use. The special overhanging or undercut nature of the die used in the seating operation enables the insulating strip to be located at an elevation materially below the elevation of the unsevered part of the metal strip, and also enables the insulating strip with the metal terminals anchored thereon to feed smoothly through the press. The undercutting of the die is especially useful in facilitating feeding of the strip if the end of the metal terminal, instead of being bent down as in Figs. 2 and 4, is allowed to remain in a position projecting beyond the lateral edges of the insulating strip, as in the construction shown in Figs. 9, 10, and 12, to be described later.

The terminal shown in Figs. 4 and 5, the manufacture of which has been described in detail above, is a terminal of great utility and satisfies most requirements. If three wires, for example, are to be connected together, one of them may have its end pushed through the hole 56, to hold the wire temporarily until it is soldered to the terminal; the second wire may have its end pushed through the eyelet 53, to hold it for soldering; and the third wire may have its end twisted one turn around the upstanding lug 63, to hold it for soldering. However, in some instances, it is preferred to have a terminal provided with screw threads for receiving a screw so that the end of a wire may be clamped under

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the head of a screw. If such a terminal is desired, it is a comparatively easy matter, after the terminal has been anchored onto the insulating strip, to thread the eyelet or boss 53 by a suitable threading die, such thread being indicated at 95 in Fig. 6. The desired screw may then be screwed into the thread 95.

In the modified form of construction shown in Figs. 6 and 7, the opening 56 in the tab 66 is omitted, and the tab 66, after extending downwardly through the notch 22, is then bent through 180° as indicated at 101 and extends upwardly again at 102 to an elevation above the top of the insulating strip 21. A wire may then be thrust endwise through the loop 101 and underneath the bottom of the insulating strip 21, as will be readily seen from Fig. 6. Another wire may be wrapped around the upstanding end 102 of the lug, if desired. Still another wire may be clamped under the head of a screw, screwed into the thread 95, while a fourth wire may be wrapped around the upstanding lug or ear 63, to hold it preparatory to soldering. Hence this form of terminal construction is particularly advantageous where several different wires are to be attached to the same terminal or connector.

This form shown in Figs. 6 and 7 can be made (except for the cutting of the threads 95) on the same apparatus illustrated in Fig. 2 and with the same steps, except for a slight variation in the shape of the punches and dies. If the hole 56 is omitted, then, of course, the punch 54, which makes this hole, is likewise omitted. The bending of the ear or lug 66 as at 101 can be accomplished simultaneously with the final operation, by altering the punch 75 and the overhanging die in the manner indicated diagrammatically in Fig. 8. The main portion of the punch 75 is the same as before, but the lateral extension which cooperates with the ear 66 is smaller, as indicated at 111, and has its bottom end curved, and the overhanging ledge 113 forming part of the die comes up fairly close to the punch portion 111, being separated from it only by the thickness of the metal of the strip 31. Hence, when the punch 75 comes down, the low end of the extension 111 will first bend the ear 66 downwardly and make the loop or curve 101, leaving the end 102 extending upwardly because the portion 113 of the die will not allow the portion 102 to bend downwardly. Then, as the punch continues its downward movement, the terminal portion with the ear 66 already bent into this form, will be severed from the rest of the metal strip 31 and will be carried down onto the insulating material and fastened thereto as before.

In Fig. 9 there is shown an electrical terminal assembly which is sometimes desired for use in certain types of electrical apparatus. In this construction, there is an insulating strip indicated in general at 131, and a plurality of metallic terminal or connector members (two being here shown, for example, at 133 and 135) are fastened to the insulating strip 131, which strip frequently is relatively thick compared to the size of the metallic members. The problem is presented of how to manufacture such an article in the most efficient and least expensive way possible, with a minimum number of manufacturing steps. Heretofore it has been proposed to fasten each one of the metallic parts on the insulating strip by a separate operation or step, but this is undesirably expensive, and can be avoided, according to the present invention, if two or more of the metallic parts are to be mounted relatively close to each

other, whether on the same insulating strip or on two adjacent insulating strips.

This invention involves the use of a relatively wide metal strip, having a width at least as great as the combined widths of a plurality of the individual metal terminals, and involves the forming of a plurality of the metal terminals in side by side relation to each other on the same strip of metal, and the simultaneous seating of such plurality of terminals on the insulating strip. This may necessitate, in some cases, a certain amount of wastage or scrap from the wide metallic strip, but the cost of such scrap is usually more than offset by the increased economy of making a plurality of metallic terminals at each single operation of the punch press, and seating them on the insulating strip in a single operation.

Usually, but not always, the metallic terminals occur in groups of terminals spaced relatively close to each other, and there may be a greater spacing between one group and the next group. Sometimes, but not always, some of the metal terminals of what may be considered one group are on one insulating strip and the rest of the metal terminals of the same group are on another insulating strip, after the final cuts have been made to sever the individual insulating strips from each other. An example of this is indicated in Figs. 9 and 10, where the final terminal assembly or finished article, as shown in Fig. 9, includes the insulating strip 131 with one metal terminal 133 near one end and another metal terminal 135 near the other end, and with a substantial space between these two metal terminals. However, if the spacing of the terminals be visualized as it occurs on a continuous strip of insulating material, before the insulating strip is cut into individual lengths, then it is seen from Fig. 10, that the spacing between the metal terminal 133 at one end of the individual insulating strip and the terminal 135 at the adjacent end of the next individual insulating strip is much closer than the spacing between the two metal terminals on the same insulating strip. Hence, according to the present invention, these metal terminals may be made most economically by forming, from a single wide strip of metal, not the two terminals that go on the same finished insulating strip, but rather one terminal to go at one end of one insulating strip and a terminal to go at the adjacent end of the next insulating strip, subsequently cutting the insulating strip between these two terminals which are formed in the same operation.

In the illustrated specific embodiment of this form of the invention, as shown in Figs. 9 to 13, inclusive, the insulating strip is indicated in general by the numeral 141, and is fed in the direction of the arrow 142 with an intermittent or step by step feeding motion, the strip being provided with suitable perforations 143 at appropriate intervals where the metal terminals are to be placed, these perforations 143 preferably being square or of other non-circular outline. The metallic strip, of copper, brass, or other suitable metal, is indicated in general at 151, and is of sufficient width so that a plurality of individual metallic connectors or terminals can be formed from the strip in side by side relation to each other and at the proper spacing from each other for seating on the insulating strip, without lateral distortion of the metallic strip. The strip of metal is fed into the press in the direction of the arrow 153, with an intermittent or step by step feed-

ing motion as previously described in connection with the first embodiment of the invention.

The punches and dies themselves are not shown in connection with this embodiment of the invention, because they will be sufficiently understood by those skilled in the art from the illustration and description of the punches and dies previously given in connection with the first embodiment. As before, a compound die and multiple punches are used on a single press, so that each cycle or stroke of the press performs several different operations on the metal, in different locations on the metal strip.

In the first operation, a suitable punch punches out the notches 157 in the outer edges of the metal strip 151 and also punches out the area 159 to sever the metal strip longitudinally into a plurality of individual metal strips or fingers, each the width of one of the individual metal terminals, and at the proper lateral spacing from each other for seating at the proper intervals on the insulating strip.

After this punching of the parts 157 and 159, the metal strip feeds forwardly one step and is then subjected to the action of a punch which forms the shallow draw 155 in each of the plurality of individual fingers or parts of the metal strip. In some cases, where the draw 155 is to be very shallow, this draw may be made in the same operation which punches out the longitudinal severing cut 159. However, in most cases, and especially where the draw 155 has any substantial depth, it is preferred to perform the severing operation at 159 during the step in advance of the draw 155, so that by the time the draw 155 is made, the wide metal strip 151 will have been severed already into the individual widths, thus enabling the metal to draw in somewhat from the side of each individual strip, when making the draw 155.

The strip of metal then moves forward another step, and in the next operation a punch indicated diagrammatically at 160, and having a pointed bottom preferably of pyramidal shape, opens up the bottom of the draw 155 not by cutting out and removing any metal but rather by slitting it preferably with a cross-shaped or X-shaped cut, so as to provide four or other desired number of projections, preferably with pointed ends, around the sides of an opening in the metal strip. This is done simultaneously on each of the plurality of individual parts into which the metal strip has been longitudinally severed.

In the next punching operation, after another feeding operation, a suitable part of the punch cooperates with the die to produce a shearing action and cuts off simultaneously one finished metal terminal from the end of each of the individual strips or fingers into which the initial wide metal strip 151 has been longitudinally cut or severed. At the same time, the punch pushes the plurality or individual metal members down onto the insulating strip 141 and seats them thereon in such position that the projections or points 161 of each metal terminal will go through the aligned square hole 143 in the insulating strip 141, and then forces the projections 161 against a clinching anvil so that they will be clinched over on the underside of the insulating strip, in a manner similar to that disclosed in the first embodiment of the invention.

Since the projections 161 are arranged around the sides of a square or other suitable non-circular geometrical figure, and since the perfo-

rations 143 into which they fit are of corresponding non-circular shape, it follows that the projections 161, when fitted snugly in the perforations 143, will keep the metal terminal from turning on the insulating strip, and thus will anchor the metal terminal sufficiently well to the insulating strip without the necessity of any further anchoring at any other point. In this way, the metal terminal, although attached to the insulating strip only at one point rather than at a plurality of spaced points, is sufficiently well anchored for all practical purposes.

Also it is seen that because of the draw 155 made previous to the formation of the projections 161, these projections may be made considerably longer than would be possible if no draw were made first. If there were no drawing operation before the punching of the projections, it is apparent that each projection could not be longer than half the transverse dimension of the hole from which the projection was formed. However, by drawing the metal as at 155 in advance of forming the projections 161, these projections can be considerably longer than half the width of the hole, and can even be longer than the entire width of the hole, if desired, and as is indicated in the drawings. Thus the terminal can be satisfactorily mounted on a much thicker insulating strip than would be possible if the manufacturing steps did not include a drawing operation in accordance with this invention.

As already indicated, the insulating strip 141, after the metal terminals are seated thereon, is cut transversely at suitable intervals to subdivide the initial long strip into individual portions having the desired number of metal terminals mounted thereon. The cuts will be made at appropriate locations so as to leave the desired number of metal terminals, at the desired spacing, on each individual insulating strip. In the embodiment shown here as an example, the cuts are made in the position indicated at 167, coming between two of the metal terminals which are simultaneously formed and simultaneously seated on the insulating strip.

Due to the forming and seating of a plurality of the individual metal terminals at each single cycle of operation of the punch press, an extremely fast and economical method of manufacture is provided, and consequently the finished articles can be produced rapidly, cheaply, and very satisfactorily.

Further mention should be made of the drawing operation which enables the anchoring projection to be made longer than would be possible without the draw. It is seen that after the draw has been made, two courses may be followed. Either the bottom of the drawn portion may be completely cut out and removed, as illustrated in Figs. 1 and 2, or the bottom may be split rather than removed and the metal from the bottom may form part of the anchoring projection, as illustrated in Figs. 10 and 11. For a given depth of draw and given width or diameter of draw, a longer anchoring projection will result from following the second procedure rather than the first. Conversely, for a given length of anchoring projection, the first procedure requires a greater depth of draw than the second. If the metal terminal is to be anchored to an insulating strip of substantial thickness, two or more draws are likely to be required in order to secure an anchoring projection of the requisite length, when the first procedure is used, whereas a single draw will often result in an anchoring

projection of the requisite length, when the second procedure is used. For this reason, the second procedure is usually preferred, and is believed to be an important feature of the present invention.

It is seen from the foregoing disclosure that the above mentioned objects of the invention are admirably fulfilled. It is to be understood that the foregoing disclosure is given by way of illustrative example only, rather than by way of limitation, and that without departing from the invention, the details may be varied within the scope of the appended claims.

What is claimed is:

1. The method of forming from a strip of metal and assembling onto a strip of insulating material a series of metallic electrical terminal members of the type wherein a portion of each terminal member lies flat on the surface of the insulating material and one end portion of each terminal member extends upwardly in upstanding relation to the surface of the insulating material, said method including the steps of intermittently feeding a strip of insulating material forwardly step by step in one direction; intermittently feeding a strip of metal forwardly step by step at an elevation above that of said insulating material and in a direction transverse to the direction of feeding movement of said insulating material, said metal strip being potentially divisible into a series of successive sections from each of which one individual terminal member will ultimately be formed; forming in each such section as it approaches but before it reaches a position over the insulating strip, a downwardly projecting hollow tubular portion; and then as such section reaches a position over the insulating strip, simultaneously severing such section from the next succeeding section of the metal strip and pressing the main body of the severed section firmly downwardly onto the insulating strip so that said tubular portion enters and seats in said insulating strip and simultaneously exerting upward pressure on one end of the severed section while the main body thereof moves downwardly, to bend said end thereof upwardly to an upstanding relation to the main body thereof.

2. The method of forming from a strip of metal of uniform width and assembling onto a strip of insulating material a series of metallic electrical terminal members of the type wherein certain portions of the terminal members are of narrower width than that of said metal strip from which they are formed, said method including the steps of intermittently feeding a strip of perforated insulating material forwardly step by step in one direction; intermittently feeding a strip of metal of uniform width forwardly step by step at an elevation above that of said insulating material and in a direction transverse to the direction of feeding movement of said insulating material, said metal strip being potentially divisible into a series of successive sections from each of which one individual terminal member will ultimately be formed; forming in each of such sections as it approaches but before it reaches a position over the insulating strip, a downwardly projecting hollow tubular portion; making cuts in each of such sections, also as it approaches but before it reaches a position over the insulating strip, to define the lateral edges of certain portions of the finished terminal member which are to be of narrower width than said metal strip, while leav-

ing such section still attached to the next succeeding section; and then as such section reaches a position over the insulating strip, simultaneously severing such section from the next succeeding section of the metal strip and pressing such severed section firmly downwardly onto the insulating strip so that said tubular portion enters and seats in said insulating strip perforation, the insulating strip with the terminal members attached being finally cut transversely into lengths at points between adjacent terminals.

3. The method as defined in claim 2, further including the step of exerting upward pressure on one end of the severed section simultaneously with the severing and downward movement thereof, to form an upstanding ear on said section as it is seated on said insulating strip.

4. The method of forming a multiplicity of individual electrical terminals from the areas of successive lengths of a strip of sheet metal and assembling such terminals on a strip of insulating material, which includes the steps of advancing a strip of sheet metal of substantial body intermittently through a series of stages in a general direction toward and in crossing relation to a strip of insulating material, forming fastening projections on successive lengths of said metal strip prior to the arrival of the advancing metal strip in close proximity to the insulating strip, severing a length of said metal strip including one of said fastening projections from the remainder of said metal strip to form an individual electrical terminal area, said severing being performed while the area to be severed is positioned in close proximity to the insulating strip and in alignment with the position it is to occupy on the insulating strip, bending a portion of the length of the metal strip forming the individual terminal area, concomitantly with the severing thereof, at a substantial angle to the remainder of the length of such terminal, seating the severed terminal forcibly against the insulating strip concomitantly with the severing and bending thereof, to assemble said terminal on the insulating strip with the fastening projection extending through the insulating strip and with the bent portion of the terminal in angular relation to the surface of the insulating strip on which the terminal is seated, feeding the insulating strip intermittently between successive severing and seating operations on the successive electrical terminals and in crossing relation to the direction of feeding advance of the sheet metal strip, so that a multiplicity of successive terminals are seated on the insulating strip in spaced relation along the length of the insulating strip, and severing the insulating strip transversely along severance lines between certain adjacent electrical terminals seated thereon, to cut the insulating strip

into a number of sections each containing a plurality of terminals seated thereon.

5. The method as described in claim 4, in which the severing of an individual terminal area from the remainder of said metal strip occurs along a severance line directly overlying the insulating strip.

6. The method as described in claim 4, in which the bending of said metal strip occurs along a bend line directly overlying the insulating strip.

7. The method as described in claim 4, in which the bent portion of the individual electrical terminal is so bent as to be in an approximately right-angle upstanding relation to the surface of the insulating strip on which the terminal is seated.

8. The method as described in claim 4, in which the bent portion of the individual electrical terminal is so bent as to be in an approximately right-angle downturned relation to the surface of the insulating strip on which the terminal is seated, to extend from the surface on which the terminal is seated down past one edge of the insulating strip.

9. The method as described in claim 4, in which the bending of each individual terminal area of said metal strip, concomitantly with the severing and seating thereof, occurs along two bend lines spaced on opposite sides of said fastening projection of such individual terminal area, one bend forming on the terminal a bent end to project upwardly in upstanding relation to the surface of the insulating strip on which the terminal is seated, the other bend forming on the terminal another bent end to project downwardly from the insulating strip surface on which it is seated, past one edge of such insulating strip.

LOUIS P. LOCKE.

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