

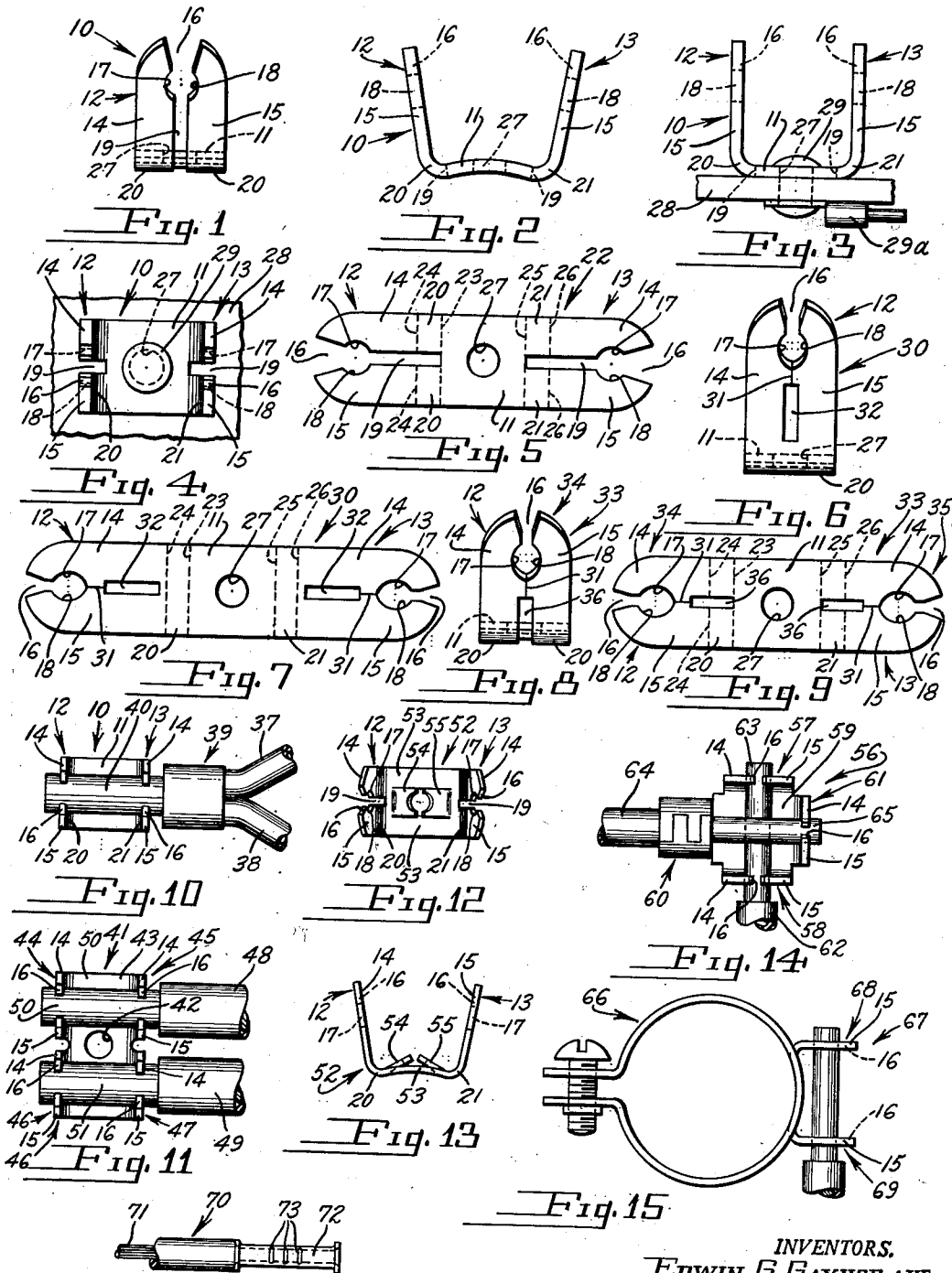
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TERMINAL CLIP

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TERMINAL CLIP

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This invention relates to new and useful improvements in electrical wiring and has particular relation to a terminal clip.

The objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein satisfactory embodiments of the invention are shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is an end elevational view showing one embodiment of the clip of the invention;

Fig. 2 is a side elevational view thereof;

Fig. 3 is a side elevational view showing a clip installed or mounted;

Fig. 4 is a top plan view of the mounted clip;

Fig. 5 is a plan view showing the pattern or blank from which a clip is formed;

Fig. 6 is an end elevational view showing a modified construction of clip;

Fig. 7 is a plan view of the pattern or blank from which the clip of Fig. 6 is formed;

Fig. 8 is a view similar to Fig. 6 but showing another modification;

Fig. 9 is a view similar to Fig. 7 but of the modification shown in Fig. 8;

Fig. 10 is a plan view showing two parallel conductors joined in a socket, the end of which is of reduced diameter and snapped into the clip of the invention;

Fig. 11 is a top plan view showing the terminal clip as adapted for two parallel conductors;

Fig. 12 is a top plan view showing the clip incorporating a spring type speed nut for holding the clip on a stud or binding post;

Fig. 13 is a side elevational view of the clip of Fig. 12;

Fig. 14 is a top plan view showing our terminal clip incorporating a strain relief;

Fig. 15 is a side elevational view showing our clip in combination with a ground clamp; and

Fig. 16 is an elevational view showing a stranded conductor equipped with a ferrule structure adapting the stranded conductor for use with our terminal clip.

Referring in detail to the drawing, and at first more particularly to Figs. 1-5, the clip of the invention is disclosed as comprising a generally U-shaped body 10 including a connecting portion 11 and a pair of arms 12 and 13 extending one from each end of said connecting portion. The arms 12 and 13 are duplicates of one another and each is split longitudinally inwardly from its outer or free end whereby each arm comprises a portion 14 and a portion 15.

Through the outer ends of the arms the splits are somewhat wedge-shaped or of gradually decreasing width from their outer ends whereby entrances 16 are formed at the

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outer ends of the arms. At their inner ends, said entrances communicate with widened portions of the longitudinal splits of the arms which widened portions or portions of increased diameter are defined by curved or concave gripping jaws 17 and 18 comprising portions of the edges of the splits and which gripping jaws are located in opposing relation.

Inwardly of the gripping jaws 17 and 18, the splits of the arms continue in the form of slots 19, which slots are carried through the curves or bends 20 and 21 constituting the junctions between the arms 12 and 13 and the connecting portion 11.

Fig. 5 shows a blank generally designated 22 and from which the body 10 is formed. For convenience, the reference numerals applied to the parts in Figs. 1-4 are applied to the corresponding parts in the blank 22. A pair of fold lines at the inner end of arm 12 are shown dotted at 23 and 24 and it will be understood that the material between these pair of lines constitutes the junction 20 of arm 12 with connecting portion 11 and it will be clear that the slot 19 is carried through such connecting portion. The same structure is indicated with respect to arm 13 wherein the corresponding fold lines are the dotted lines 25 and 26.

In the formed clip, connecting portion 11 is upwardly bowed as in Fig. 2 and through the mid portion of said connecting portion a hole 27 is formed for the passage of a securing means, as a rivet or the like. In Figs. 3 and 4, clip 10 is shown as mounted on a portion 28 of "Bakelite" or other di-electric material comprising part of a housing, mounting, etc. In this structure, a rivet 29 is employed for riveting the body 10 to the di-electric 28 and for electrically connecting a current carrying member 29a to said body. Clearly, the tightened rivet has flattened the connecting portion 11 of the body against the material 28 bringing the arms 12 and 13 from the diverging relation of Fig. 2 into a parallel or substantially parallel relation.

Rivet 29 comprises a contact and the bowed structure 11 of the clip provides means whereby should shrinkage occur in the "Bakelite" or other di-electric 28, the spring structure composed of the bowed portion of the clip prevents loosening of the rivet 29. Any shrinkage of the material 28 will result in the connecting portion 11 of the clip attempting to or tending to return to its initial bowed condition so that the rivet will be kept tight in place and a good electric contact always maintained between the clip 10 and the rivet 29.

The clip of the invention may be used in many ways. When mounted as in Figs. 3 and 4, bus wires or terminals of conductors may be easily and quickly attached to the clip and a good electrical connection established. For such purpose, a bus wire or other terminal may be laid across the upper or outer ends of the arms 12 and 13 partially entered into the entrances 16 at the outer ends of said arms. Then the bus wire or wire terminal or the like is forced inwardly.

Body 10 is of spring stock, preferably of beryllium-copper or Phosphor bronze, and the longitudinal splits in the arms 12 and 13 will permit the portions 14 and 15 of these arms to spring apart as the bus wires or terminals are forced inwardly through the narrow inner ends of the entrances 16. Inwardly of such narrow portions, the bus wires or terminals enter the larger diameter portion of the splits through the arms and are located between the jaws 17 and 18.

As the clip is of spring stock, immediately the bus wire or terminal passes inwardly of the narrow inner ends of the entrances 16, the arm portions 14 and 15 spring back toward one another or toward their normal relation and the jaws 17 and 18 grip the bus wire or the terminal providing a good electrical contact and securely anchoring

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the wire or terminal. Thus, the wire or terminal is securely mounted and electrically connected simply by pushing it into place and it may be detached by a reverse movement since on an outward pull on the wire or terminal by a pressure applied to the underside of the wire or terminal in its portion between the arms 12 and 13, the portions 14 and 15 of the arms will be caused to spring apart to permit of outward movement of the wire or terminal through the entrances 16.

In the modification of Figs. 6 and 7, the clip is generally designated 30. Clip 30 will be used in the same manner as clip 10. Clip 30 is of a springy conducting material, as beryllium-copper or Phosphor bronze, and is otherwise much the same as clip 10 and the same parts have been designated by the same reference characters. In clip 30, the arms 12 and 13 are not split longitudinally to the same extent as are the arms in clip 10, and inwardly of the jaws in clip 30, a slit 31 is located between the inner ends of the jaws and a somewhat shortened slot 32.

This provides a structure wherein the arm portions 14 and 15 may be sprung apart for the entrance of bus wires or terminals into position to be gripped by the jaws and yet leaves more metal in each jaw whereby there will be a greater area of contacting surface between the jaws 17 and 18 of clip 30 and the inserted bus wire or terminal than in the case with the corresponding jaws of the clip 10. There will be some additional contact between the jaws and the underside of the wire or terminal.

Referring now to the modification of Figs. 8 and 9, the clip there shown and generally designated 33 is of the construction of the clip 30 with the exception that the arms 34 and 35 of clip 33 are somewhat shorter than are the arms 12 and 13 of the clip 30. A slit 31 forms part of the split through the arms 34 and 35 and communicates the inner ends of the jaws with the outer end of a slot 36. Slots 36 extend through the curved or bent portions providing the junctions between the arms 34 and 35 and the connection portion 11 of clip 33.

Thus, the difference between the clips 33 and 30 resides in the fact that in the clip 30 the slots 32 terminate above the bottom of the clip, while in the clip 33 the lower ends of the slots 36 are carried around into the bottom or connecting portion 11 of the clip. Since the arms of clip 30 are longer, sufficient flexibility is obtained with the structure shown, but with either clip, a greater area of contact is established between the jaws 17 and 18 and an inserted wire or terminal than with the clip 10.

A plurality of the clips 10, 30 and 33 may be employed together. That is, the clips may be arranged with the connecting portion of one across the upper side of the connecting portion of another and all secured by a single rivet or the like. In this way, two or even three of the clips may be stacked to form terminal clips for two or three conductors. Where a clip 33 is lowermost, its shorter arm will in no way interfere with the insertion of a conductor into the jaws of the longer arms of a clip 10 or 30.

Fig. 10 illustrates the manner in which two parallel conductors may be easily and quickly electrically connected with any of the clips previously described as, for example, the clip 10. In this figure, a pair of conductors 37 and 38 have the ends of their wires connected in a socket 39 including a reduced diameter portion 40. This portion 40 is substantially rigid and is of a diameter to be snapped into a terminal clip 10 by aligning it with and pushing it inwardly through the entrances 16 to the jaws of the clip.

Fig. 11 shows a clip generally designated 41 and comprising a wider body structure constituting a double clip having an opening 42 through its connecting portion 43 for the passage of a rivet or other anchoring means and having arms 44 and 45 constituting one pair and arms

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46 and 47 constituting a second pair, the arms of the pairs being in alignment and the entire device being an integral structure.

It will be understood that the pairs of arms 44 and 45, and 46 and 47 correspond exactly with the arms 12 and 13 of Figs. 1-7, and the arms 33 and 34 of Figs. 8 and 9. That is, the arms of the pairs of clip 41 are constructed as are the arms previously described. This clip 41 is for use as a terminal clip for two parallel conductors 48 and 49. As shown, conductors 48 and 49 have the insulation removed from their end portions 50 and 51 comprising solid conductor wires.

The clip generally designated 52 in Figs. 12 and 13 is the same as the clip 10 previously described in many respects and where the parts are the same, the same reference characters have been employed. Thus, the clip 52 includes the arms 12 and 13. However, the connecting portion of clip 52 is slightly modified and it is therefore designated 53. This connecting portion is bowed as and for the same purpose as the bow in connecting portion 11. In addition, connecting portion 53 is perforated and has portions 54 and 55 lanced and pressed upwardly therein whereby a spring type speed nut is formed for the rapid mounting of the clip on a stud or binding post.

With this structure, it is merely necessary to press the clip over the stud or binding post until the bottom of the clip hits the material mounting the stud or binding post. The threading may continue until the connecting portion 53 of the clip is flat against the mounting means and will then act as described in connection with the bowed connecting portion of clip 10.

The terminal clip of Fig. 14 is generally designated 56 and the same comprises arms 57 and 58 of the structure and for the purpose of arms 12 and 13 first described. The clip 56 includes a connecting portion 59. As thus far described, the clip is the same as that designated 10, 30 or 33 above. Clip 56 includes a strain relief extension 60. Strain relief extension 60 is normal to the planes of the arms 57 and 58 and then the clip includes an arm 61 opposite the strain relief extension 60. Arm 61 will be of the structure of either of the arms 57 or 58 which, it will be understood, are of identical construction.

In using this clip, a conductor 62 will have an exposed portion of its solid wire 63 gripped by the jaws of the arms 57 and 58, the wire being merely pushed down through the entrances in the outer ends of the arms into positions between said jaws. The arm portions spring apart to permit of insertion and then move toward one another to grip the wire 63 as described specifically when considering clip 10. Arm 61 is somewhat longer than arms 57 and 58 and a conductor 64 has an exposed end portion 65 forced through the entrance and into a position between the jaws of arm 61, the jaws being located outwardly with respect to the jaws of arms 57 and 58 whereby the wire 65 is above the wire 63, although it may be in contact therewith since the wires are otherwise electrically connected through the body of the clip.

Then the strain relief extension 60 is simply rolled about and tightened against or clamped to the insulation of conductor 64 whereby pull on such conductor will not draw its exposed wire 65 longitudinally removing it from the arm 61. Additionally, this strain relief will prevent bending of the conductor in a manner to pry or tilt its exposed wire 65 upwardly out from between the jaws of the arm 61.

Referring now to Fig. 15, the clip of the invention is there disclosed in combination with a ground clamp. In said figure, the ground clamp is generally designated 66 and the clip is generally designated 67. The clip may be formed substantially as in Fig. 2 and welded or soldered to the ring of the ground clamp or portions of the latter may be lanced and pressed upwardly providing arms 68 and 69 of the clip, which arms are of the construction of the arms of the clips previously described, i. e., arms

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68 and 69 are split longitudinally, the splints defining entrances to gripping jaws formed in the arms and the arms are of spring stock whereby the gripping jaws are effective.

The terminal clip of the invention works best with a solid conductor wire. Where a stranded conductor wire is being used, we employ a ferrule as shown in Fig. 16. In that figure, a conductor is generally designated 70 and within the insulation covering of the latter is a stranded wire 71. The insulation is peeled back from the end of said wire and then a metal ferrule 72 is slipped over the exposed end portions of the strands. Actually, the ferrule is a hollow or tubular rivet and after the same is slipped over the wire strands, the metal of the rivet is in its central portion crimped as at 73 against the wire strands for securely fastening the rivet or ferrule in place and to the wires or dip soldered in a good electrical contact with them.

Preferably, the ferrule or rivet is flared at both ends whereby when it is forced into place through the entrances to the arms of a clip and is being gripped by the jaws of said arms, it may not be drawn out of place by a longitudinal movement. Also, it is desired that the strands of the conductor be exposed at their ends and for sufficient length to extend substantially entirely through the ferrule or rivet whereby when the mid portion of the latter is crimped inwardly as at 73 it will be engaging the strands inwardly of their free ends and will be securely attached to them.

From the foregoing description it will be understood that all of the clips disclosed are of beryllium-copper or other conducting springy material. Further, in each of the clips (with the exception of clip 67 on the ground clamp), the connecting portion is bowed for the purpose fully considered when describing the clip 10. In the structure of Fig. 15, including the ground clamp, a mounting or securing stud or rivet will not be employed through the connecting portion of clip 67.

Having thus set forth the nature of our invention, what we claim is:

1. A snap-in terminal clip for use with a conductor, comprising a single piece substantially U-shaped body including a connecting portion and a pair of arms, each of said arms being divided longitudinally by a split extending inwardly from its outer end and each arm inwardly of its outer end including a narrows ending in a pair of gripping jaws which in the free position are spaced apart a distance less than the diameter of the conductor by an amount such that the stress produced in the terminal clip by forcing the conductor inwardly through the narrows is less than the elastic limit of the material of which the terminal clip is composed, the splits being of decreased width from the outer ends of the arms to the gripping jaws to provide the narrows through which the conductor is forced into position between said jaws, said terminal clip being of resilient electrically conducting material whereby on forcing of the conductor through the narrows in said arms the portions of the arms at the respective sides of the split spread apart and immediately the conductor passes inwardly of the narrows into said gripping jaws, said arm portions spring back toward one another, and said jaws grip said conductor between them, the gripping jaws in said arms being aligned to provide an effective grip while facilitating entry and removal of the conductor.

2. A snap-in terminal clip for use with a conductor, comprising a single piece substantially U-shaped body including a connecting portion and a pair of arms, each of said arms being divided longitudinally by a split extending inwardly from its outer end and each arm inwardly of its outer end including a narrows ending in a

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pair of gripping jaws which in the free position are spaced apart a distance less than the diameter of the conductor by an amount such that the stress produced in the terminal clip by forcing the conductor inwardly through the narrows is less than the elastic limit of the material of which the terminal clip is composed, the splits being of decreased width from the outer ends of the arms to the gripping jaws to provide the narrows through which the conductor is forced into position between said jaws, said terminal clip being of resilient electrically conducting material whereby on forcing of the conductor through the narrows in said arms the portions of the arms at the respective sides of the split spread apart and immediately the conductor passes inwardly of the narrows into said gripping jaws, said arm portions spring back toward one another, and said jaws grip said conductor between them, and said splits in said arms inwardly of said jaws comprising slits in the metal of the arms whereby when said jaws are closed on the conductor, portions of the jaws are at the inner side of the conductor, the gripping jaws in said arms being aligned to provide an effective grip while facilitating entry and removal of the conductor.

3. A snap-in terminal clip for use with a conductor, comprising a single piece substantially U-shaped body including a connecting portion and a pair of arms, each of said arms being divided longitudinally by a split extending inwardly from its outer end and each arm inwardly of its outer end including a narrows ending in a pair of gripping jaws which in the free position are spaced apart a distance less than the diameter of the conductor by an amount such that the stress produced in the terminal clip by forcing the conductor inwardly through the narrows is less than the elastic limit of the material of which the terminal clip is composed, the splits being of decreased width from the outer ends of the arms to the gripping jaws to provide the narrows through which the conductor is forced into position between said jaws, said terminal clip being of resilient electrically conducting material whereby on forcing of the conductor through the narrows in said arms the portions of the arms at the respective sides of the split spread apart and immediately the conductor passes inwardly of the narrows into said gripping jaws, said arm portions spring back toward one another, and said jaws grip said conductor between them, and said splits in said arms inwardly of said jaws comprising slits in the metal of the arms whereby when said jaws are closed on the conductor, portions of the jaws are at the inner side of the conductor, and said splits inwardly of said slits comprising slots extending toward the inner ends of the arms, the gripping jaws in said arms being aligned to provide an effective grip while facilitating entry and removal of the conductor.

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