

Sept. 28, 1937.

J. G. JACKSON ET AL

2,094,404

SOLDERLESS CONNECTER

Filed Feb. 19, 1934

2 Sheets-Sheet 1

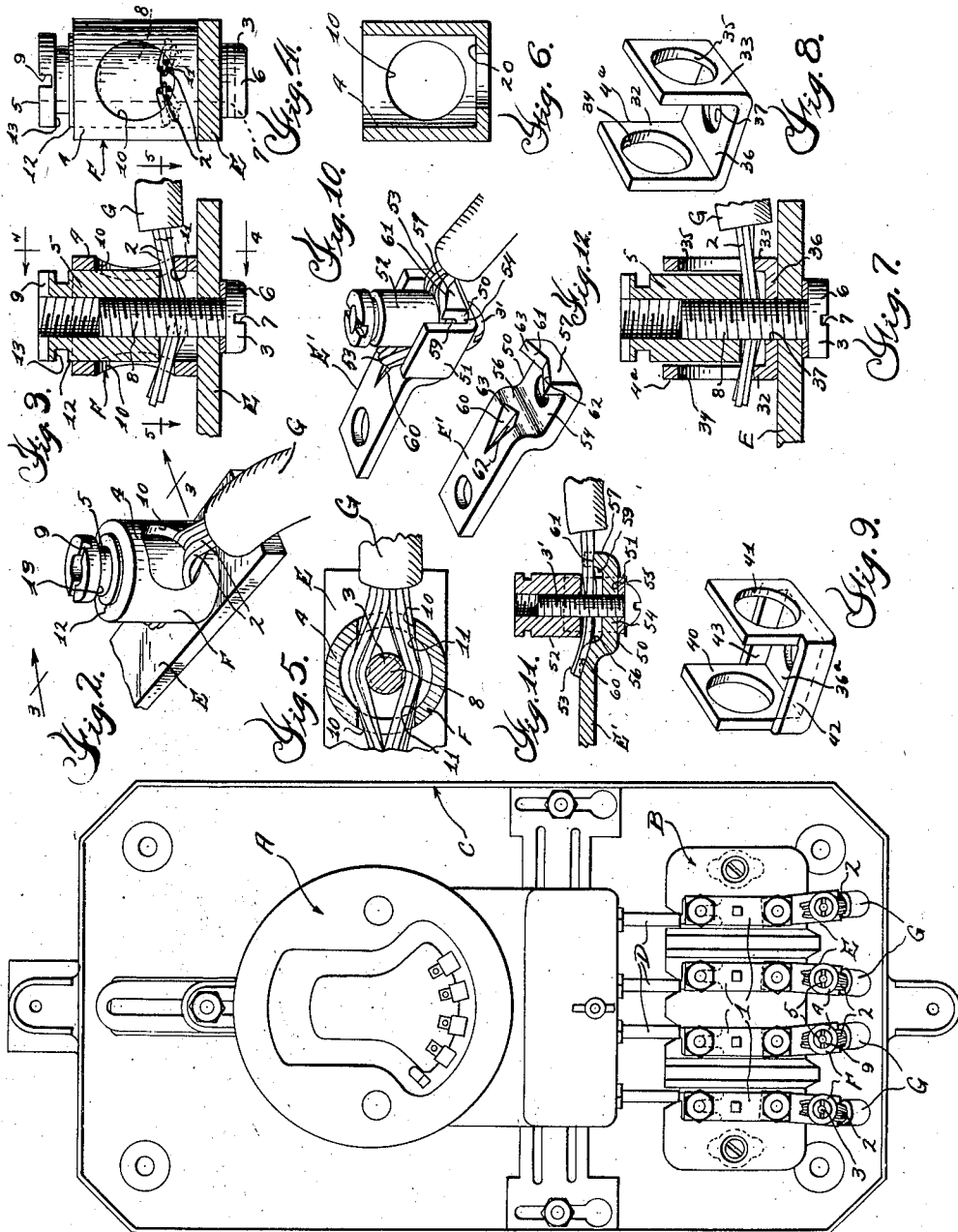


Fig. 1.

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2 Sheets-Sheet 2

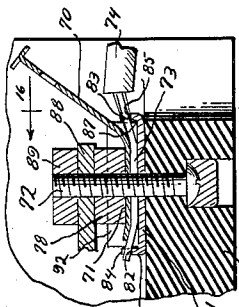


Fig. 15.

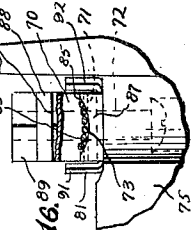


Fig. 16.

Fig. 20.

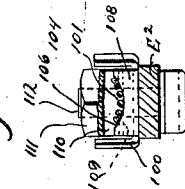
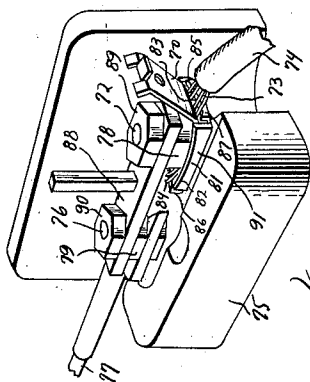


Fig. 14.

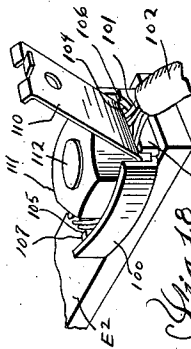


Fig. 18.

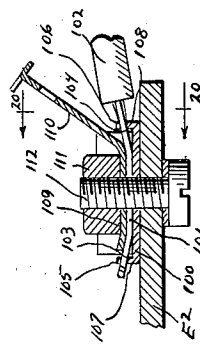


Fig. 19.

Fig. 17.

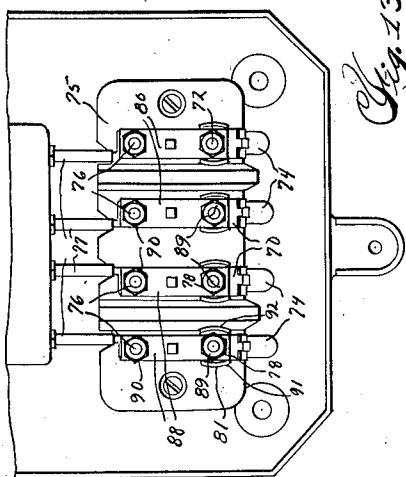
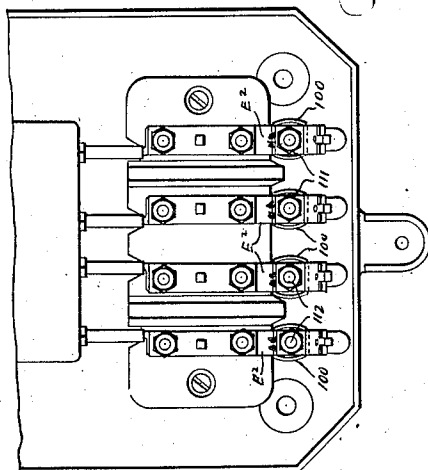


Fig. 13.



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SOLDERLESS CONNECTER

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Application February 19, 1934, Serial No. 712,068

10 Claims. (Cl. 173—324)

This invention relates generally to electrical equipment and refers more particularly to a solderless connector for electric current carrying parts or conductors.

One of the essential objects of the invention is to provide as a substitute for the usual solder lugs employed in electrical equipment a solderless connector that is not only electrically as good and mechanically as secure as such lugs, but that embodies a number of improvements and advantageous features.

In many instances where cable terminal connectors are required, as in meter test blocks, it has been necessary to use additional parts in conjunction with the solder lugs as attaching means for test clips so that the required temporary connections to external circuits could be made. Actually, such additional parts necessitate the use of more material and assembly operations, hence they add to the cost of manufacturing such devices. They also take up space which could otherwise be used for other purposes. As a result, such lugs and/or additional parts have not only proven unsatisfactory but objectionable. Therefore, it is another object of the present invention to provide a connector that is not only solderless, but has as a part thereof suitable means for attachment of test clips and the like.

It is a further object of the present invention to provide a connector wherein a stud, screw, bolt or the like not only serves as an anchorage means for the connector, but also as a binding post for the strands of the electric cable.

Another object is to provide a connector wherein the body of the connector is provided with aligned transverse openings for the reception of a wire or the strands of an electric cable and is hollow for the reception of a clamping nut.

Another object is to provide a connector wherein the wire or strands of the cable are held in the body against the stud, and the body is held against the electric conductor to which the stud is attached by the nut on the stud.

Another object is to provide a connector wherein the aligned openings in the body are shaped to direct the wire or strands of the cable toward and against the stud so as to insure a positive and firm connection between the parts when the nut is tightened.

Other objects, advantages and novel details of construction of this invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a front elevation of electrical equipment including solderless connectors embodying our invention;

Figure 2 is a perspective view of one of the strap conductors and showing a solderless connector embodying our invention applied thereto;

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 3;

Figure 5 is a horizontal sectional view taken substantially on the line 5—5 of Figure 3;

Figure 6 is a vertical sectional view through a slightly modified form of body;

Figure 7 is a vertical sectional view similar to Figure 3, but showing another modification;

Figure 8 is a perspective view of the body illustrated in Figure 7;

Figure 9 is a perspective view similar to Figure 8, but showing a slightly modified construction;

Figure 10 is a perspective view of another modification;

Figure 11 is a vertical sectional view through the structure illustrated in Figure 10;

Figure 12 is a perspective view of the conductor bar illustrated in Figures 10 and 11;

Figure 13 is a top plan view of a test block and associated parts illustrating another modification;

Figure 14 is a fragmentary perspective view of the construction illustrated in Figure 13;

Figure 15 is a vertical sectional view through the construction illustrated in Figure 14;

Figure 16 is a vertical sectional view taken substantially on the line 16—16 of Figure 15;

Figure 17 is a view similar to Figure 13, but showing another modification;

Figure 18 is a fragmentary perspective view of the structure illustrated in Figure 17;

Figure 19 is a vertical sectional view through the construction illustrated in Figure 18;

Figure 20 is a vertical sectional view taken substantially on the line 20—20 of Figure 19.

Referring now to the drawings, A is an electric meter, B is a test block having laterally spaced test links I, C is a casing forming a common support for said meter and test block, D are links projecting endwise from the upper ends of the links I to the meter, and E are strap conductors projecting endwise from the lower ends of the links I and carrying connectors F embodying our invention. As shown, each strap conductor E carries a connector F and each connector F serves as a terminal for the strands 2 of a suitable electric cable G. Preferably, each connector F

illustrated in Figures 1 to 5 comprises a stud 3, a hollow body 4 and a clamping nut 5. The head 6 of the stud is slotted as at 7 and is located beneath the strap conductor E, while the shank 8 is exteriorly threaded and extends through and upwardly above the strap conductor E. The nut 5 is mounted on the shank 8 of the stud and is preferably cylindrical in configuration. Preferably, this nut has a transversely extending slot 9 in its upper end for the reception of a screw driver or the like (not shown) by which it may be adjusted on the stud. The body 4 is preferably tubular in form and is sleeved on the nut 5. As shown, the body 4 is provided at diametrically opposite points thereof substantially midway of its ends with circular openings 10 for the reception of the strands 2 of the electric cable G.

In use, the cable strands 2 straddle the stud shank 8 and are received in both openings 10. Inasmuch as the openings 10 receiving said strands are circular, it is apparent that such strands will be directed inwardly toward and against the stud shank 8 by the curved edges 11 of said openings when the nut 5 is tightened. Hence, the strands will not only be held tightly against the stud shank 8, but also against the edges 11 of the openings in the body 4. In this connection, it will also be noted that the engagement of the nut 5 with the strands 2 in the openings 10 in the body will serve to hold the body sleeved upon the nut and firmly against the strap conductor E. Thus, an extremely firm and positive connection between the parts is provided. In fact, our construction is such that it will function just as efficiently to hold one or a number of wires or strands. In either instance, the wire or strands will be forced against the stud 3 and the body 4 will be forced against the strap conductor E. Actually, electrical measurements of the conductivity of the connection effected by our solderless connector are considerably better than those of the usual solder lugs. Moreover, decidedly less space is occupied by our connector. Preferably the length of the nut 5 relative to the length of the body 4 is such that a portion 12 of the nut projects upwardly above the upper end of the body 4 when the nut is tightened, and said projecting portion 12 is preferably provided with a peripheral groove or slot 13 which may be engaged by the teeth or jaws of suitable test clips (not shown) when it is desired to test the meter A.

In Figure 6, we have illustrated a slight modification in which the tubular body 4 is provided at its lower end with an upturned flange 20 which, when the parts are assembled, is disposed beneath the lower end of the nut 5 and prevents accidental displacement of said body when free of the cable wire or strands.

In Figures 7 and 8, we have illustrated another modification in which the body 4^a is U-shaped instead of tubular. In this construction opposite sides 32 and 33 respectively of the body are substantially parallel and have aligned circular openings 34 and 35 respectively therein for receiving the strands 2 of the electric cable. The base 36 of the U has a circular hole 37 that receives the shank 8 of the stud 3, and the nut 5 is adjustable on the stud between the side walls 32 and 33 of the U to effect the proper connection between the parts.

In Figure 9, we have illustrated another modification in which the sides 40 and 41 respectively of the U-shaped body are connected and reinforced by webs 42 and 43 which extend upwardly from the base 36^a and extend between said sides.

In Figures 10 to 12, inclusive, we have illustrated another modification wherein the copper strap conductor E' has a substantially U-shaped portion 50 on the stud 3' within a U-shaped body 51 of steel and cooperating with a nut 52 on the stud for clamping the cable wires or strands 53. As shown, the stud 3' and nut 52 correspond to the nut 5 and stud 3 respectively. Preferably the base 54 of the U-shaped portion 50 rests flat upon the base 55 of the U-shaped body 51, while opposite sides 56 and 57 respectively of the U-shaped portion 50 are provided at opposite edges 58 and 59 respectively of the base 55 and have substantially V-shaped recesses 60 and 61 respectively in their upper edges for the reception of the cable wires 53. Thus, when the nut 52 is tightened, the wires 53 will be urged toward the stud 3' and will be clamped firmly against the inclined edge portions 62 and 63 respectively forming the sides of the V-shaped recesses 60 and 61.

In Figures 13 to 16, inclusive, we have illustrated another modification in which a test clip 70 of conducting material has a substantially flat portion 71 sleeved on a stud 72 of steel and serving as a washer for clamping engagement with the cable wires 73. In this construction there are four studs such as 72 serving as terminals for the wires of four cables 74 and anchored in a test block 75 in substantially parallel relation to four studs 76 of steel constituting terminals for suitable copper meter connector links 77. Suitable nuts 78 and 79 respectively of conducting material are employed for holding the test clips 70 and links 77 respectively on the studs 72 and 76.

Preferably the wires 73 of the cables are received in U-shaped bodies 81 on the studs 72 and are held firmly against the edges 82 and 83 respectively of substantially V-shaped recesses 84 and 85 respectively in upturned flanges 86 and 87 at opposite ends of the bodies by the flat portions 71 of the test clips and the nuts 78. The usual test links 88 of copper are mounted on the studs 72 and 76 and are held in assembled position by suitable nuts 89 and 90 respectively. Thus, in this construction the current from the cables 74 passes through the test clips 70, nuts 78, test links 88, nuts 79 to the meter connector links 77. Consequently, the nuts 78 and test clips 70 not only effect a mechanical connection, but also an electrical connection as well with the wires 73 of the cables. As a result, the U-shaped bodies 81 may be formed of steel as they function as holding means or retainers only. In this connection it will be noted that the side walls 91 and 92 respectively of the U-shaped bodies hold the wires 80 against spreading, while the V-shaped edge portions 82 and 83 of the upturned flanges 86 and 87 cooperate with the studs 72, side walls 91 and 92 and test clips 70 to hold the wires 80 against pulling out.

In Figures 17 to 20, inclusive, we have illustrated another modification in which the U-shaped bodies 100 are formed of conducting material such as copper and seat directly upon strap conductors E² of copper. In this construction the wires 101 of the cables 102 are received in the U-shaped bodies and are clamped against the edges 103 and 104 respectively of substantially V-shaped recesses 105 and 106 respectively in upturned flanges 107 and 108 at opposite ends of the bodies by the flat portions 109 of test clips 110 and nuts 111 on the studs 112. Thus, the bodies 100 serve as electric conductors as well as mechanical retainers. As a result, both the nuts

111 and studs 112 may be formed of steel as they function as securing means only. The term "aperture", as used in the appended claims, is intended to be given its broadest possible interpretation and is meant to include opening, recess, groove, hole, etc.

What we claim as our invention is:

1. In an electric cable connection, the combination of an electric cable made up of a plurality of strands, a securing stud, a body on said stud and provided at diametrically opposite points thereof with apertures receiving said cable strands, said strands being divided into two groups and disposed on opposite sides of said stud, and means adjustable on the stud for pressing the strands against the edges of said apertures, said edges being shaped to urge said strands together and about the stud.

2. A connection for electrical conductors comprising in combination, a stranded electric cable, a member supporting said strands, a stud extending through said member and dividing said strands into two groups, a member adjustable on said stud to clamp the strands of the cable against the first mentioned member, portions of the first mentioned member at approximately diametrically opposite sides of said stud being formed to urge the strands of the cable toward each other and about said stud while the wires are clamped by the second mentioned member.

3. An electric cable connection comprising a stud, a nut adjustable thereon, a cable receiving member on the stud beneath the nut having a flat base and upstanding flanges provided with narrowing apertures, the narrowest portions of said apertures being aligned with the stud, and an electric cable disposed in said apertures and spanning said member with its strands divided and disposed on opposite sides of the stud, said nut clamping the strands against the edges of the apertures.

4. An electric cable connection comprising a stud projecting from a current carrying member, a member adjustable on the stud, a cable receiving element on the stud beneath the adjustable member, and an electric cable spanning said element beneath the adjustable member with its strands divided and disposed on opposite sides of the stud, said element having portions tending to urge the strands of the cable toward the stud when said strands are pressed by the adjustable member against said element.

5. An electric cable connection comprising in combination, an electric cable made up of a plurality of strands, a member receiving said strands, a stud extending through the member, and a nut on the stud adjustable to clamp the strands against said member, the strands being divided and extending across the member on opposite sides of the stud beneath the nut, the member being provided with portions crowding the strands toward each other.

6. In an electric cable connection, the combination of an electric cable made up of a plural-

ity of strands, a conductor, a stud extending from said conductor, a cup-shaped member having a substantially flat base with an opening therein receiving said stud and upstanding sides provided with opposite grooves aligned with said stud, said strands being disposed in said grooves and divided into two roughly equal groups placed on opposite sides of said stud, and means adjustable on the stud for clamping strands against the edges of the grooves, said edges being formed to urge the strands together and about said stud under the clamping force exerted by said means.

7. In an electric cable connection, the combination of an electric cable made up of a plurality of strands, a conductor, a stud extending from said conductor, a body receiving said stud and provided with opposite apertures aligned with the stud and receiving said strands, the strands being divided on opposite sides of the stud, the edges of the apertures being shaped to urge the strands together and about the stud, and means adjustable on the stud for pressing the strands against the edges of the apertures, said edges forming the sole support for the strands under said means.

8. A connection for electrical conductors comprising a strap conductor having spaced portions provided with apertures, an electric cable disposed in said apertures and spanning said spaced portions, a stud extending upwardly through said conductor in line with said apertures and dividing the strands of said cable, and a nut adjustable on the stud to clamp the strands against the edges of said apertures, the said edges of said apertures being inclined to direct the strands toward and against the stud when the nut is tightened.

9. A connection for electrical conductors comprising a stud, a clamping nut adjustable on the stud, and a sleeve for the nut loose on the stud, having openings in opposite sides thereof, and an electric cable disposed in said openings and spanning said sleeve with its strands divided and disposed upon opposite sides of said stud beneath the nut, the edges of said openings being so formed that the strands upon opposite sides of the stud will be urged together about said stud when the nut is tightened.

10. A connection for electrical conductors comprising a stud attachable to a current carrying member, a clamping nut adjustable on the stud, and a substantially U-shaped member having its base on the stud beneath the nut and having openings in the upstanding sides thereof, and an electric cable disposed in said openings and spanning said member with its strands divided and disposed upon opposite sides of said stud beneath the nut, the edges of said openings being so formed that the strands upon opposite sides of the stud will be urged together when the nut is tightened.

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