

Dec. 31, 1935.

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2,026,029

CABLE CONNECTION

Original Filed Aug. 19, 1933

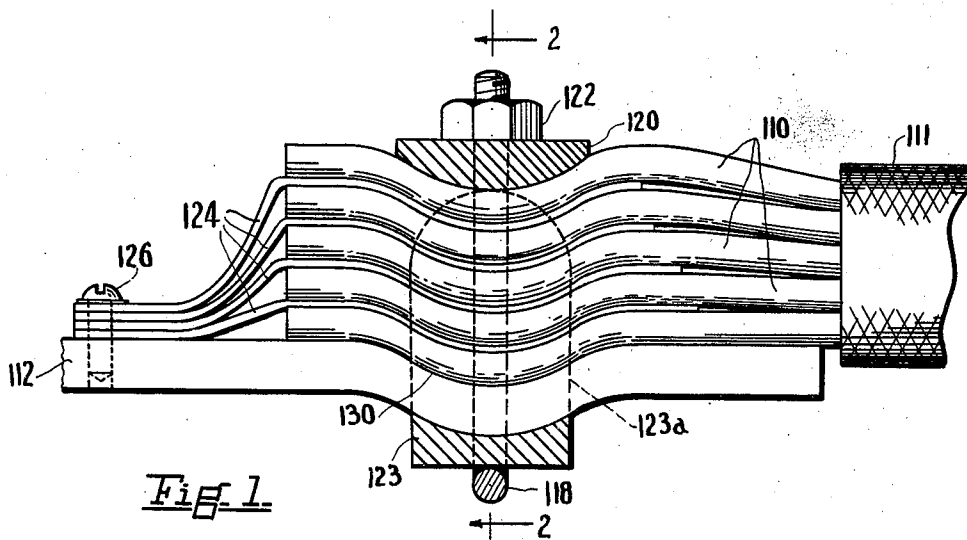
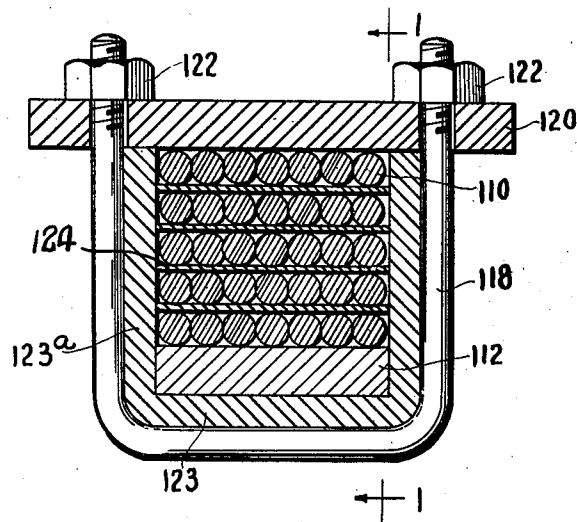


Fig. 2.

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2,026,029

CABLE CONNECTION

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Application August 19, 1933, Serial No. 685,819
Renewed April 25, 1935

18 Claims. (Cl. 173-263)

This invention relates to cable connections.

A principal object is to provide in a cable connection a connector which will positively insure electrical connection between each and every strand of the cable and the part to which the cable is to be connected, all without the use of solder or other solidified fluid bonding means, and which will interlock the cable to the part to which the cable is to be connected, in order to insure a firm and secure interlocked connection for the cable.

In the embodiment disclosed, the strands are fanned out in a plurality of rows and copper laminations, directly connected to the bus bar or other part to which the cable is to be connected, are disposed between these rows of strands, the bared strands, with the laminations therein contained, being distorted for interlocking purposes and clamped to the bus bar by a suitable clamping means.

One of the features of the construction heretofore described is the visible assurance that every strand that ought to be present, is present, and that every strand is in electrical connection with other parts of the connection. In connections wherein the connector is of the familiar solder-lug type, it often happens that strands are cut away in order that the cable end be fitted into the sleeve of the lug, and/or that strands are not in electrical contact with connector parts, and therefore are not functioning to conduct current through the connection. In such constructions, if these objectionable features exist, they cannot be discovered by an inspector because the strands are not visible, being enshrouded in the sleeve of the lug. In the constructions here shown, the strands are always exposed and visible, and accordingly, if it so happens that a strand is broken, or that it is not in electrical contact with other parts of the connection, as will only rarely be the case, these facts will become instantly apparent, and will call the attention of an inspector thereto, so that they may be remedied.

Another feature of the construction heretofore described is the assurance that the clamping pressure relied on to form the connection is distributed more or less evenly to all of the strands. In well known clamping sleeve connectors, wherein a clamping sleeve surrounds a bared cable, the pressure of the sleeve is not distributed evenly to all strands, but, on the contrary, is most unevenly distributed, most of it being applied to the outer strands, and some, perhaps, being applied to the inner strands. If the pressure is not great enough, the inner strands will not be

clamped, or in contact; and if the pressure be too great, the outer strands will be crushed and broken. In the connection here shown, the strands are arranged in an ordered fashion, and the direction and effect of the clamping action is predeterminable, so that it can be certain that all strands are clamped and to an equal degree. In the connection here shown, the clamping effect is in one direction, and the strands are so arranged and confined that they are affected uniformly by a clamping effect, exerted in this one direction.

An embodiment of the invention of this application has been disclosed in the appended drawing. In this drawing,

Fig. 1 shows in elevation a connection including a clamp type solderless connector, employing laminations between rows of strands;

Figure 2 is a section view as if on the line 2-2 of Figure 1.

In Fig. 1, there is shown a solderless connector for connecting the strands 110 of the bared end of a cable 111 to a bus bar or the like, referenced 112. In the form shown, there happen to be thirty-five strands, and these are shown as arranged in five rows of seven strands each. The strands are enclosed within a clamping U bolt 118 which embraces the bared end of the cable and the bus bar, and clamping pressure to clamp the cable end to the bus bar is provided by a clamping plate 120 and clamping nuts 122. Within the bight of the bolt 118 is a U sleeve or plate 123 having wings 123a which terminate below the plate 120, and help restrain sidewise movement of the strands.

It is proposed by the present invention to insert, between the rows of strands, a plurality of flexible copper laminations 124. These are inserted while straight and planar, but are afterwards bent down to the shape shown in Fig. 1, so as to be clamped and connected to the bus bar by a screw 126, passed through aligned holes in the laminations 124 and into a tapped hole of the bus bar. These laminations are in intimate and direct electrical contact with each and every one of the strands of the cable and form a superior electrical contact between all of such strands, both inner and outer, and the bus bar 112.

It is noted that the bus bar is downwardly bent, as at 130 to provide a depression into which the strands 110 and the laminations 124 are distorted and clamped, so as to be interlocked to the bus bar.

While the connection means of Fig. 1 is shown as including one large cable, it might well in-

clude a plurality of superimposed smaller ones, whose strands are fanned out in rows to occupy the relative positions of the rows of strands 110 of the large cable shown.

5 It is to be emphasized at this time, that in the use of the connector shown, the strands are first disposed in the connector in a predetermined and ordered arrangement and that the clamping pressure is distributed uniformly and by pre-
10 determination over the strands to insure satisfactory contact.

It will be observed that while the concave surface has been shown as provided on the base plate 112, and the convex surface on the moving
15 plate 120, these parts might well be reversed, if desired.

Now having described a preferred embodiment of the invention herein disclosed, reference will be had to the following claims which determine
20 the scope of the invention.

What I claim is:

1. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing
25 one another, each strand being of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which
30 is disposed the row of strands, means forcing the parts towards each other, each of the parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the
35 space between the parts in a plane substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the row of bared strands in the direction of relative movement of the parts, the
40 strands projecting from the space between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces.

45 2. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing one another, each strand being of substantial
50 rigidity and cross section greater than the rigidity and cross section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which parts is disposed the row of strands, means forcing the parts towards each other, each of the
55 parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the space between the parts in a plane substantially transverse to the direction of relative movement of the parts, the parts having mating
60 concavo-convex or male and female surfaces for distorting everyone of the row of bared strands in the direction of relative movement of the parts, the strands projecting from the space between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces, at least one of the parts being rigid and incapable of deflection.

70 3. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing one another, each strand being of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, a pair
75 of clamping parts, at least one of which is of

electrically conducting material, between which parts is disposed the row of strands, means forcing the parts towards each other, each of the parts engaging the strands individually and with a uniformly distributed clamping and contacting
5 pressure, the row of bared strands projecting from the space between the parts in a plane substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for
10 distorting everyone of the row of bared strands in the direction of relative movement of the parts, the strands projecting from the space between the parts in a direction transverse to the axes of curvature of the concavo-convex or male
15 and female surfaces, and means for preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable.

4. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing
20 one another, each strand being of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which
25 parts is disposed the row of strands, means forcing the parts towards each other, each of the parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the space between the parts in a plane substantially transverse to the direction of relative
30 movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the row of bared strands in the direction of relative movement of the parts, the strands projecting from the space between the parts in a direction transverse to the
35 axes of curvature of the concavo-convex or male and female surfaces, the means forcing the parts towards each other comprising a U bolt which embraces the strands and the parts.

5. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing
45 one another, each strand being of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which parts is disposed the row of strands, means forcing the parts towards each other, each of the
50 parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the space between the parts in a plane substantially transverse to the direction of relative movement of the parts, the parts having mating
55 concavo-convex or male and female surfaces for distorting everyone of the row of bared strands in the direction of relative movement of the parts, the strands projecting from the space between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces, the means forcing the parts towards each other and preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable
60 comprising a U bolt which embraces the strands and the parts.

6. In an electrical cable connection, the combination of an electrical cable having a plurality of bared conductor strands each of which is of
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substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, the strands being fanned out in a plurality of superimposed rows, with no strands in a row crossing any other strand in that row, a plurality of clamping parts, there being a set of one for each row, and one other, each part of the set of one for each row being of electrically conducting material, each part engaging each of the strands of a row individually and with a uniformly distributed clamping and contacting pressure, means forcing the parts towards one another, the rows of bared strands projecting from the spaces between the parts in planes substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the strands in the direction of relative movement of the parts, the strands projecting from the spaces between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces.

7. In an electrical cable connection, the combination of an electrical cable having a plurality of bared conductor strands each of which is of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, the strands being fanned out in a plurality of superimposed rows, with no strands in a row crossing any other strand in that row, a plurality of clamping parts, there being a set of one for each row, and one other, each part of the set of one for each row being of electrically conducting material, each part engaging each of the strands of a row individually and with a uniformly distributed clamping and contacting pressure, means forcing the parts towards one another, the rows of bared strands projecting from the spaces between the parts in planes substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the strands in the direction of relative movement of the parts, the strands projecting from the spaces between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces, at least one of the parts being rigid and incapable of deflection, certain of the parts being thin and resilient so as to be readily capable of deflection, and auxiliary means for clamping the resilient parts to the rigid part.

8. In an electrical cable connection, the combination of an electrical cable having a plurality of bared conductor strands each of which is of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, the strands being fanned out in a plurality of superimposed rows, with no strands in a row crossing any other strand in that row, a plurality of clamping parts, there being a set of one for each row, and one other, each part of the set of one for each row being of electrically conducting material, each part engaging each of the strands of a row individually and with a uniformly distributed clamping and contacting pressure, means forcing the parts towards one another, the rows of bared strands projecting from the spaces between the parts in planes substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the strands in the direction of relative movement of the parts, the strands projecting

from the spaces between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces, at least one of the parts being rigid and incapable of deflection, said means preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable.

9. In an electrical cable connection, the combination of an electrical cable having a plurality of bared conductor strands each of which is of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, the strands being fanned out in a plurality of superimposed rows, with no strands in a row crossing any other strand in that row, a plurality of clamping parts, there being a set of one for each row, and one other, each part of the set of one for each row being of electrically conducting material, each part engaging each of the strands of a row individually and with a uniformly distributed clamping and contacting pressure, means forcing the parts towards one another, the rows of bared strands projecting from the spaces between the parts in planes substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the strands in the direction of relative movement of the parts, the strands projecting from the spaces between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces, at least one of the parts being rigid and incapable of deflection, the means forcing the parts towards each other comprising a U bolt which embraces the strands and the parts.

10. In an electrical cable connection, the combination of an electrical cable having a plurality of bared conductor strands each of which is of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, the strands being fanned out in a plurality of superimposed rows, with no strands in a row crossing any other strand in that row, a plurality of clamping parts, there being a set of one for each row, and one other, each part of the set of one for each row being of electrically conducting material, each part engaging each of the strands of a row individually and with a uniformly distributed clamping and contacting pressure, the rows of bared strands projecting from the spaces between the parts in planes substantially transverse to the direction of relative movement of the parts, the parts having mating concavo-convex or male and female surfaces for distorting everyone of the strands in the direction of relative movement of the parts, the strands projecting from the spaces between the parts in a direction transverse to the axes of curvature of the concavo-convex or male and female surfaces, at least one of the parts being rigid and incapable of deflection, and means forcing the parts towards each other and also preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable and comprising a U bolt which embraces the strands and the parts.

11. An electrical cable connection comprising a U bolt, a plate through which the free ends of the bolt pass and against which react the bolt nuts, a U sleeve within the bolt, a bus bar within the sleeve, superimposed rows of cable strands within the sleeve, and between the bus bar and the plate, laminae between the rows, and means

outside the sleeve for securing the laminae to the bus bar.

12. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing one another, each strand being of substantial rigidity and cross-section greater than the rigidity and cross-section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which parts is disposed the row of strands, means forcing the parts towards each other, each of the parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the space between the parts in a plane substantially transverse to the direction of relative movement of the parts, at least one of the parts being rigid and incapable of deflection, and means for preventing movement of the strands in the space between the parts in a direction perpendicular to the axis of the cable, the strands being spread over substantially the entire area of the parts.

13. In an electrical cable connection, the combination of a plurality of bared conductor strands fanned out in a row, with no strands crossing one another, each strand being of substantial rigidity and cross-section greater than the rigidity and cross-section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which parts is disposed the row of strands, means forcing the parts towards each other, each of the parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the space between the parts in a plane substantially transverse to the direction of relative movement of the parts, at least one of the parts being rigid and incapable of deflection, and means for preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable, the strands being spread over substantially the entire area of the parts.

14. In an electrical cable connection, the combination of an electrical cable having a plurality of twisted strands, a portion of the cable being bared and conductor strands thereof being untwisted and fanned out in a row, with no strands crossing one another in the connection, each strand being of substantial rigidity and cross section greater than the rigidity and cross section of filaments or hairs, a pair of clamping parts, at least one of which is of electrically conducting material, between which parts is disposed the row of strands, means forcing the parts towards each other, each of the parts engaging the strands individually and with a uniformly distributed clamping and contacting pressure, the row of bared strands projecting from the space between the parts in a direction substantially transverse to the direction of relative movement of the parts, at least one of the parts having its surface deformed for distorting the row of bared strands in the direction of relative movement of the parts, the strands projecting from the space between the parts in a direction transverse to the direction of distortion of the strands.

15. A combination of the character described in claim 14 wherein at least one of the parts is rigid and incapable of deflection.

16. A combination of the character described in claim 14, including means for preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable.

17. A combination of the character described in claim 14 wherein the means forcing the parts towards each other comprises a U bolt which embraces the strands and the parts.

18. A combination of the character described in claim 14 including a U bolt embracing the strands and the parts for forcing the parts towards each other and preventing movement of the strands from the space between the parts in a direction perpendicular to the axis of the cable.

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