Feb. 28, 1939. C. L. PEIRCE, JR 2,148,960

SOLDERLESS CONNECTOR

Filed April 4, 1933

Fig. 1.

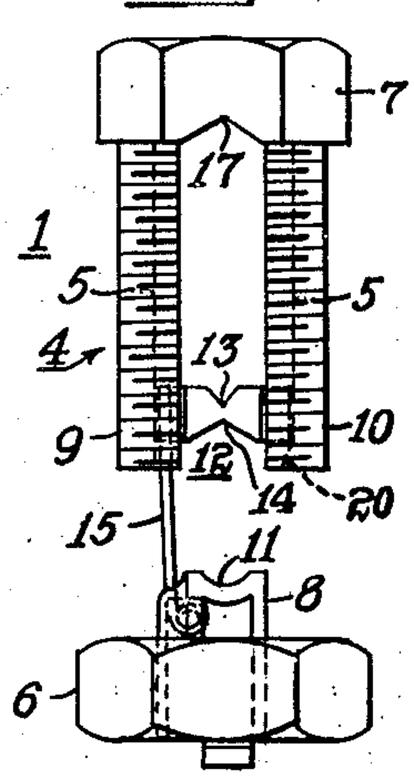


Fig. 2.

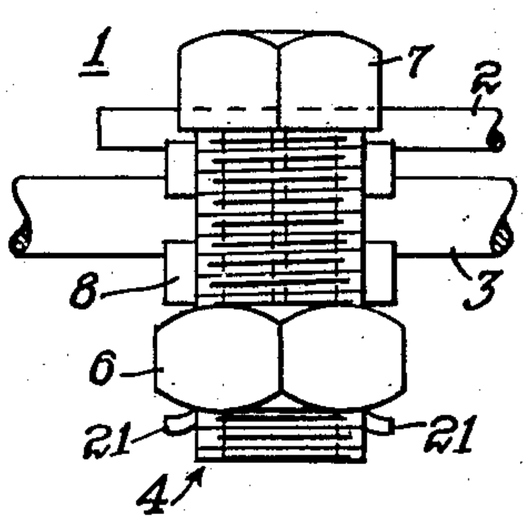
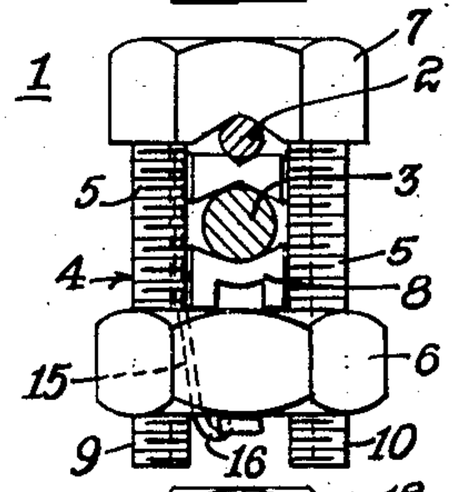


Fig. 3.



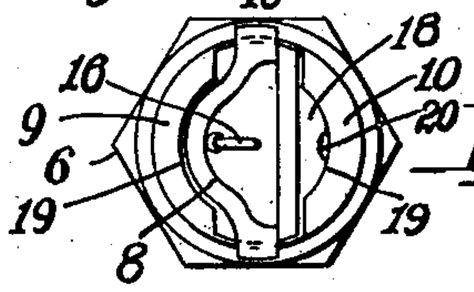


Fig. 3a

Fig. 4.

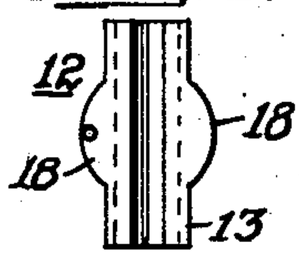


Fig. 6.

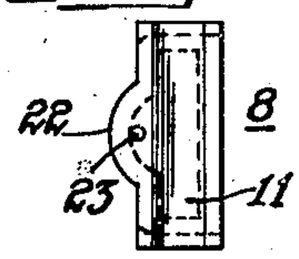


Fig. 5.

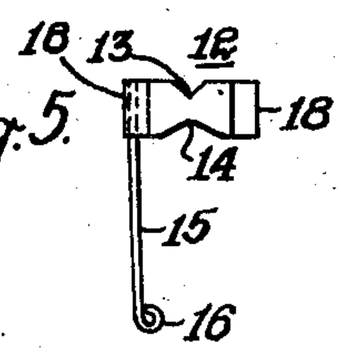


Fig. 7.

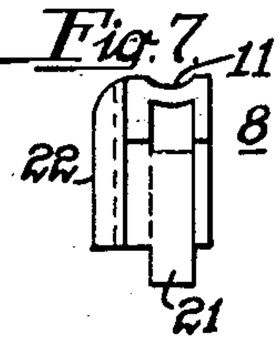


Fig. 8.

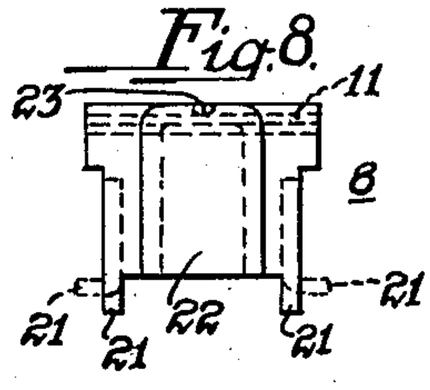


Fig. 9.

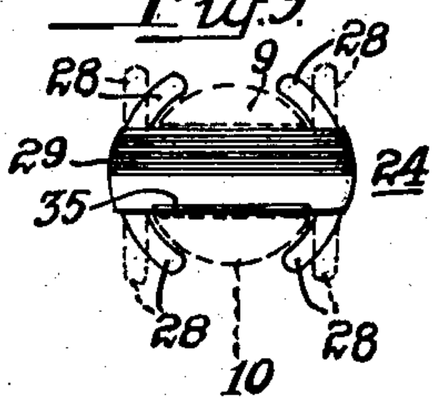


Fig. 10.

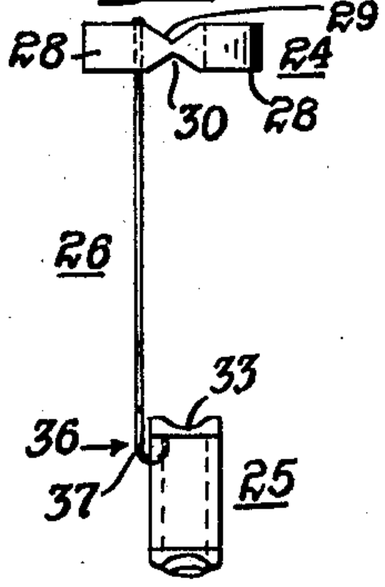
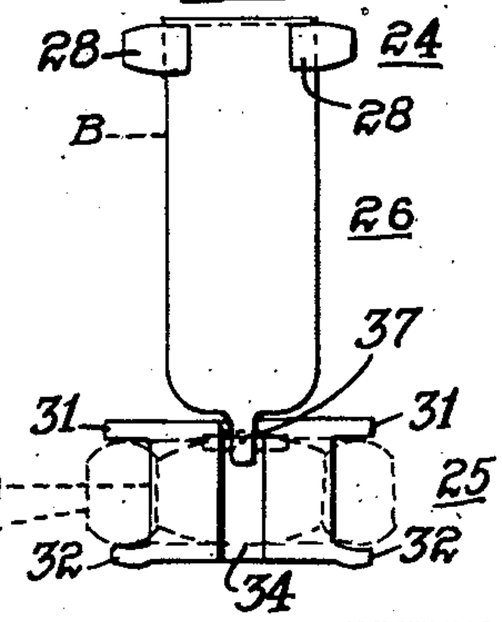


Fig. 11.



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His Attorneys

Patented Feb. 28, 1939 2,148,960

UNITED STATES PATENT OFFICE

2,148,960

SOLDERLESS CONNECTOR

Charles L. Peirce, Jr., Pittsburgh, Pa., assignor of one-half to Hubbard and Company, a corporation of Pennsylvania

Application April 4, 1933, Serial No. 664,340

1 Claim. (Cl. 24—243)

This invention relates to solderless connectors such as are employed for coupling electrical conductors. Such connectors are used quite extensively for connecting or attaching service conductors to main feeder lines, for connecting transformer leads to power supply conductors, and for other analogous purposes.

The majority of solderless connectors used in the past and those now supplied to the trade have been constructed substantially in accordance with the disclosure of United States Patent No. 1,206,044 dated November 28, 1916.

There are several objections to such prior art connectors in that in order to attach them to a main feeder conductor, for example, it is necessary to remove a nut forming part of such connector. Since the main conductors are almost always charged or live it is customary for the workmen handling these connectors when attaching the same, to work with rubber gloves, and for this reason the nuts are frequently dropped. Instead of replacing the nut, many workmen throw the connector away and start with a new one. This practice, therefore, results in waste of connectors and loss of time.

An object of this invention is the provision of a connector in which the component parts of the connector will be always maintained in assembled relation when prepared for attachment to conductors.

Another objection to the prior art connectors referred to above is that, where the connectors were used for joining conductors of different diameters or gauge, the smaller conductor, instead of centering on the larger conductor, tended to move off center and crowd into the space between one side of the conductor and one side of the connector. For this reason, the connection thus made was not permanently reliable because the pressure between the conductors continually decreased and a loose connection resulted. Also, since the conductors were usually of copper, and only line contact was made between them, they crushed at the line of contact, and flowed slightly, causing the connection to become loose.

An object of this invention is, therefore, the provision of a connector which shall not become loose in service and which is so constructed as to prevent relative shifting of the conductors.

Another object of this invention is the provision of a connector that shall provide increased surface contact with conductors as compared to the objectionable line contact of prior art connectors.

A further object of the invention is the provision of a connector having higher current carrying capacity than similar prior art connectors while still remaining cool in service.

Other objects and advantages of the invention will either be apparent or understood from the following description taken in conjunction with the accompanying drawing in which:

Figure 1 is a view in side elevation of a connector embodying the present invention, the clamp parts thereof being shown disengaged from but maintained in assembled relation to each other;

Fig. 2 is a view taken at right angles to the view of Fig. 1, showing the connector in operative relation to a pair of conductors which have been connected or joined mechanically in electrically conductive relation to each other;

Fig. 3 is a view of the connector shown in Fig. 2 looking from right to left as seen in Fig. 2;

Fig. 3*a* is a bottom plan view of the connector shown in Figs. 1, 2, and 3;

Fig. 4 is a top plan view of a contact block embodied in the connector of the above mentioned figures;

Fig. 5 is a view in side elevation of the connector block of Fig. 4;

Figs. 6 and 7 are top plan and side elevational views, respectively, of a contact block which is carried by one of the clamp parts of the connector shown in Figs. 1, 2, and 3;

Fig. 8 is a view in front elevation of the contact block shown in Figs. 6 and 7;

Fig. 9 is a top plan view of a modified form of contact block which may be substituted for the block shown in Figs. 4 and 5;

Fig. 10 is a view in side elevation of the contact block of Fig. 9 and a contact block which is designed to be carried by the nut of the connector shown in Figs. 1, 2, and 3, there being means provided on the contact block of Fig. 9 for holding the contact block and nut in assembled relation to the connector when the nut is removed; and

Fig. 11 is a view in front elevation of the elements shown in Fig. 10.

Throughout the drawing and specification like reference characters indicate like parts.

Referring to the drawing, the connector 1 there shown is designed primarily for attaching a service conductor to a main or feeder conductor, or for attaching a dead-end conductor to a through conductor. Since service conductors are usually dead-ended and the feeders are through

conductors, conductors 2 and 3 are illustrated as dead-end and through conductors, respectively.

The connector comprises a bifurcated member or clamp part 4 having threads 5 thereon for the reception of a nut 6, and a head 7. Nut 6 carries a contact block 8, a portion of which extends through the opening thereof, and is turnably supported thereby. Contact block 8 is adapted to move between the legs 9 and 10 of the bifurcated member as the nut is turned on or off the same. The top face of the block has a groove 11 therein, in which the main conductor 3 may lie or seat when the connector is attached thereto.

The connector also includes a contact block 12 disposed between the legs of the bifurcated member and adapted to move therebetween in the direction of travel of nut 6. The opposite faces of block 12 may be grooved as at 13 and 14 to form seats for conductors 2 and 3.

In order that nut 6, the contact block 8 and the bifurcated member 4 may be maintained in assembled relation to each other when the nut is removed to prepare the connector for attachment to the main and service conductors, a link 15 is provided. The link is anchored in contact block 12 and has a sliding connection with contact block 8. The lower end of the link terminates in a scroll or hook 16 which prevents contact block 8 from slipping off the same when the nut is removed from the bifurcated member. Thus, when the nut is removed, the nut and contact block 8 will be suspended from the link as shown in Fig. 1, so that the lineman may work freely and will not be hampered by the possibility of the nut falling to the ground.

When the connector has been prepared for connection to the conductors, as shown in Fig. 1, the bifurcated member is placed over the main conductor and the nut threaded thereon. The nut is advanced until there is sufficient space between the head 7 and block 12 to accommodate the service conductor 2. The dead-end of the conductor is then inserted lengthwise through the space between this block and head 7 and the nut drawn up tight. When the nut is drawn up tight, conductor 2 is clamped between the head 7 and block 12 and conductor 3 is clamped between blocks 8 and 12. Thus, current may flow from one conductor to the other through the contact blocks.

As may be seen in Figs. 2 and 3, link 15 is drawn upwardly between the legs of the bifurcated member when nut 6 has been tightened as much as possible when the conductors are in place so that the link is concealed and protected by the legs of the bifurcated member when the connector is attached to conductors.

In order to increase the area of contact between conductor 2 and head 7, the head may be provided with a groove or recess 17.

After the conductors have been joined or clamped together by means of the connector, the connector may be wrapped with tape as is customary.

Since the head 7 and the contact blocks 8 and 12 engage a relatively large portion of the surface area of the conductors, nut 6 may be drawn up tightly to exert a relatively high compressive force on the conductors causing a tight connection to be made without overstressing the metal of which the conductors are made. Since the metal is not overstressed, it will not flow and cause the connection to become loose after it has been in service for a time.

In the prior art connectors, the conductors were placed in direct contact, so that only line contact was made between them. Hence, the metal was nearly always overstressed so that the connection would work loose. Also, since there was only line contact between the conductors, the current carrying capacity of the connection was materially less than that of the conductors, so that excessive heating often occurred and resulted in what is commonly referred to as a hot connection.

Since the connector herein disclosed provides considerable contact area with the conductors, the connection will have a relatively high current carrying capacity with the result that a hot connection is not likely to occur except on sustained overload conditions.

The component parts of the connector above described may be made from metal having high current conductivity, such as copper, and designed to accommodate any size of conductor, or conductors or different sizes. In the drawing the conductors are shown as being of different sizes or gauge because service wires or conductors are usually smaller than the main or feeder conductors to which they are connected. However, the main and feeder conductors may be of the same size, as the connector is adapted to suit such cases.

In the design of the connector, the bifurcated member 4 may be formed from square or hexagonal stock so that the head may be held by a wrench when the nut is tightened or taken off. The threads on part 4 may then be cut, the body thereof bored, and slots cut therein to form the legs 9 and 10. Since most of the current in the connector is carried by contact blocks 8 and 12, the bifurcated member may be made of material having higher tensile strength than copper and the blocks may be made from substantially pure copper. However, it is to be borne in mind that when a selection of material is made for the bifurcated member, the possibility of galvanic action should be taken into account. For this reason, the metal of which the component parts of the connector are made, should be, as nearly as possible, alike, and as free from galvanic action as the case admits.

Contact block 12 may be made in a die designed to form the conductor receiving grooves 13 and 14. The block may also be formed with arcuate projections 18 adapted to register in the curved surfaces 19 formed on the interior of the legs of part 4 by the boring operation, previously mentioned. These curved surfaces and the arcuate projections form in effect, a tongue and groove connection which holds the block in place and prevents longitudinal movement thereof between the legs of the bifurcated member. Since the ends of the block extend through part 4, the block cannot turn between the legs thereof.

In order that block 12 shall not drop out of part 4 when nut 6 is removed, the end of one of the legs may be provided with a short inwardly projecting lug 20. This lug supports the block when the parts of the connector occupy the relative positions indicated in Figure 1.

Contact block 8 may be formed in a die from sheet material of copper or other metal having high current conductivity, and so shaped that the portion containing recesses 11 will lie across the nut. The bottom portion of this block may be provided with short lugs 21 which may be bent outwardly to lock the block to the nut.

In order that the block may be guided in its travel between the legs of the bifurcated member,

one side of the block is formed with an arcuate bulge 22 that registers with the inner curved surface of leg 9 of said member. The opposite side of said block engages the edges of leg 10. Thus, the block is held in its proper position relative to block 12 when the nut is threaded on part 4 to clamp the conductors together.

The link 15 which holds nut 6 and block 8 in assembled relation to the connector part 4, may be attached to the connector in various ways. As shown, the upper end of the link is disposed in an opening in the block and anchored therein as by brazing or welding, and the lower end of the link extends through an opening 23 in the top of bulge 22 of block 8 and terminates in the scroll or hook above mentioned, which, being larger than this opening will not permit the link to pull through the opening in the block as is evident by inspection of Fig. 1.

In Figs. 9, 10, and 11, contact blocks 24, 25 and a connecting link 26 therefor are shown which may be substituted for the contact blocks 8 and 12 and link 15 of the connector shown in Figs. 1, 2, and 3*a* and illustrated in detail in Figs. 4 to 8, inclusive.

Block 24 may be formed in a die and comprises a body portion 27 adapted to extend through the space between the legs 9 and 10 of the bifurcated member. The body portion may be provided with lugs 28 which may be bent and shaped to conform substantially to the contour of the exterior surface of the connector legs and thereby partially embrace the same, and with conductor receiving recesses or seats 29 and 30. The legs of the bifurcated member are illustrated in broken lines in Fig. 9 in order to show how the contact block is located when assembled with the connector.

Contact block 25 may be formed in a die from a sheet or blank of metal such as copper. When thus formed, the block is hollow and of box-like formation, the body of which extends through the opening in the nut and provides sufficient space between the nut and block to accommodate the legs of the bifurcated member.

The top of block 25 is provided with lugs 31 adapted to span the opening in the nut, and the bottom thereof is provided with lugs 32 which may be bent outwardly so as to overlap the lower face of the nut, after the block has been inserted through the opening thereof. Thus contact block 25 is interlocked with the nut and is turnably mounted therein.

The top of the block may be grooved or recessed as at 33 to provide a seat for conductor 3 that will contact a substantial portion of the surface area of the conductor.

One side of contact block 25 has a slot 34 therein to accommodate the lower end of link 26 and the bottom is open to permit the mounting of the block thereon. Link 26 may be formed from a relatively thin, flat strip of metal the upper end of wh'ch is bent, as at 35, over one edge of the contact block 24 or otherwise secured thereto. The lower end of the strip terminates in a hook 36 of substantially T shape. As seen in Fig. 11, the leg 37 of the hook is made narrow so that it may move in slot 34 in the block. The cross-bar of the T is disposed within the block and is of such length that it will pass through the open bottom thereof.

When the nut is removed from the bifurcated member, the nut and block occupy the broken line position indicated at A and position B when threaded thereon. Position B indicates that the nut and block are out of engagement with the lower end of the link when the nut is drawn up to position in which the conductors are clamped between the head 7 of the bifurcated member and the blocks 24 and 25.

From the above description taken in connection with the drawing of the connector, it will be observed that the component parts of the connector are held intact and in assembled relation at all times, and especially when prepared for attachment to conductors so that, therefore, no part of the connector will be dropped by the workmen while engaged in the act of joining one conductor to another. The parts of the connector in immediate engagement with the conductor provide large areas of contact therewith so that neither the parts nor the conductors will be overstressed and crushed in case the nut is drawn up tightly. The large surface contact also insures a permanently reliable connection and one having high current capacity. Since the connector provides independent bearing areas for the conductors, line contact therebetween is avoided and furthermore, relative shifting of the conductors if any occurs, will not cause the connection to work loose.

While a preferred form of connector has been shown and described, it is to be understood by those skilled in this art that various modifications and changes made be made in the details and form of construction of the connector as a whole and of its component parts without departing either from the spirit or the scope of the invention. It is desired, therefore, that only such limitations shall be placed on the invention as are imposed by the prior art and the appended claim.

What I claim as new and desire to secure by Letters Patent:

A solderless connector for joining conductors comprising a threaded bifurcated member, a contact block movably disposed between the legs of the bifurcated member, a nut adapted to be threaded on or off the bifurcated member, a contact block turnably mounted on the nut and adapted to operate between the legs of the bifurcated member, said blocks, when the nut is threaded on the bifurcated member, being adapted to clamp a conductor therebetween, and the first-mentioned block being disposed to clamp a conductor to the bifurcated member and a link between said blocks and disposed along the inside face of one of the legs of the bifurcated member for supporting the nut against complete removal from the bifurcated member, said link having a slip connection with the contact block in the nut.

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