July 14, 1959 H. P. DUPRE ET AL 2,895,002

COPPER TO ALUMINUM STIRRUP

Filed Nov. 17, 1954

Fig. 1.

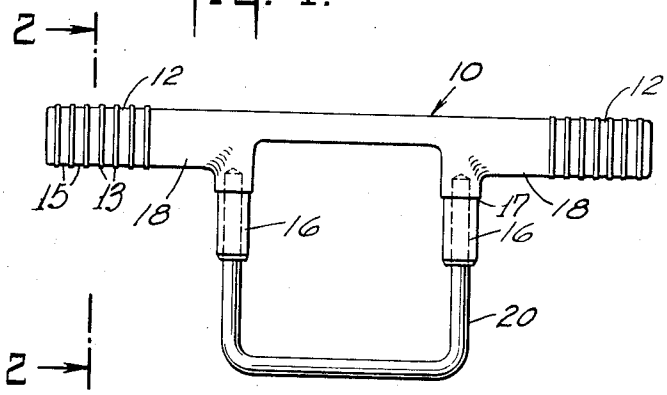



Fig. 2.

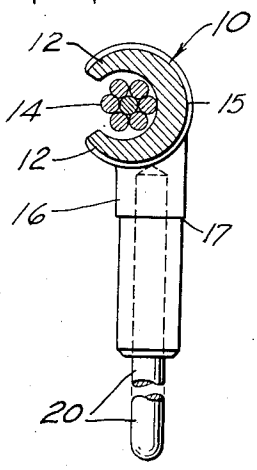



Fig. 3.

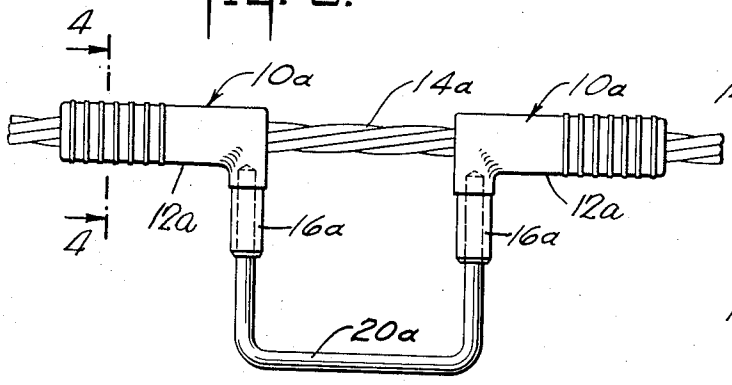
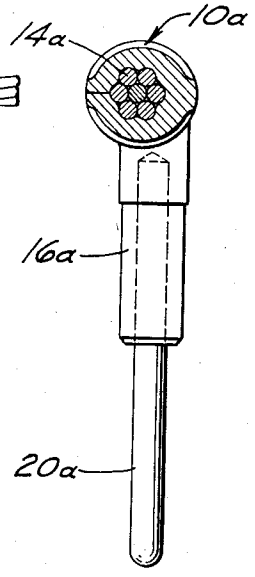



Fig. 4.




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United States Patent Office 2,895,002
Patented July 14, 1959



2,895,002

# COPPER TO ALUMINUM STIRRUP

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Application November 17, 1954, Serial No. 469,522

2 Claims. (Cl. 174—71)

Our invention relates principally to a connector for making a copper tap connector to an aluminum power line. Usually the resulting exposed copper to aluminum connection is subject to electrolytic corrosion. The devices hitherto employed required spring pressure, or a screw actuated clamping mechanism which usually damaged the aluminum cable. To lessen the electrolytic action, the copper or brass parts were plated to permit contact with the aluminum conductor.

Among the objects of our invention are to provide an aluminum to copper connector that may be safely connected to an aluminum cable, to provide a factory built copper to aluminum connector that does not require skilled field technicians to install; to provide such a device that is corrosion resistant, and relatively easy to manufacture; and to provide a connector made of any malleable metal suitable for joining one conductor to another angularly positioned conductor.

We accomplish these and other objects and obtain our new results, as will be apparent from the device described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawing in which:

Fig. 1 is a plan view of the stirrup forming our invention.

Fig. 2 is a sectional view of the stirrup taken in the plane 2—2 of Fig. 1 and hooked on the aluminum cable and shown uncrimped.

Fig. 3 is a plan view of a modified type attached to a cable.

Fig. 4 is a sectional view of the crimped connection of Fig. 3 taken in the plane 4—4 of Fig. 3.

Our device comprises an aluminum body **10** having a C-shaped or hooked lip portion **12** forming a lateral opening for a run element for clamping the body to an endless power line aluminum cable **14**. The body is further provided with tap sockets **16** formed into one side **18** of the C-shaped portion and at a right angle to the run cable for the tap connection. The sockets **16** are located inwardly of the outer extremities of the body **10**.

As is shown in Figs. 1 and 2, two such suitable sockets **16** are formed for insertion therein to a sufficient distance of the two ends of a U-shaped copper rod or bale **20** of sufficient diameter to provide, when compressed as at **17**, adequate resistance to pullout, mechanical strength and electrical conductivity.

The lip portion **12** is crimped to the aluminum cable **14** to form a permanent connection of aluminum to aluminum outside of the U shaped member **20**. When a copper tap connection is sought, it is made directly to the copper bale, bringing like metals into contact. The bale and aluminum body are preferably factory installed to each other, insuring a uniformly ideal connection.

The rate of corrosion is directly related to current density on the surface of the anodic material, i.e. the aluminum. Accordingly, deterioration can be reduced to a minimum by making the exposed surface of the



aluminum connector greater than is ordinarily required to keep electrolytic current densities at low value, making corrosion losses insignificant.

The aluminum connector of our design is permanently suspended from the aluminum cable. This position will prevent the copper salts from reaching the aluminum conductor and causing electrolytic corrosion. By placing the copper conductor under the aluminum conductor, this is avoided.

Bolts and nuts are eliminated by our construction, as are copper bushings, thus avoiding elements that have hitherto given poor corrosion resistance. Plating of the parts is rendered unncessary. To minimize creep, particularly of the softer aluminum conductor, the right combination of contact area and contact pressure is necessary. The aluminum body being made massive with respect to the copper bale, sufficient resilience is provided to permit expansion of the wire while following up relaxation and creep to prevent loosening of the joint.

In actual tests, connectors of our design show a joint conductivity well in excess of 100% relative to equivalent conductor lengths.

In Fig. 3, we have illustrated a modification of our design comprising the two L-shaped connectors **10***a* for a run aluminum cable **14***a*, each connector having a lip shaped portion **12***a*, and an extending socket **16***a* for receiving the copper bale **20***a*. In this design, the copper stirrup may be made as long as desired without the necessity of lengthening the aluminum body to a corresponding length. The sockets **16***a* are located inwardly of the outer extremity of the two L shaped connectors **10***a*. The lip portions **12***a* are located outside of the U shaped member **20***a*.

Instead of employing sockets as at **16** and **16***a*, the copper bale may be secured to the aluminum connector body directly by sprayed metal or other suitable attaching means, making certain that the current densities are at a minimum, as has been previously described.

The connector body is shown provided with crimping ribs **13** to define the crimping areas **15** and provide proper positioning of the crimping tool, not shown.

To obtain a crimp which does not injure or distort the cable, we employ a specialized shape for the connector. This result is accomplished by using an inner conductor engaging surface which is circular in cross-section, having a diameter larger than the diameter of the cable to be crimped, and with a partial circumference equal to the complete circumference of the cable. The inner and outer eccentric circular shapes produce a diminishing thickness towards the two ends of the connector legs. Thus the metal is thickest where the strength is most needed in the crimped connector. Normally, when crimping a C shaped connector of uniform wall thickness with a mouth wide enough to receive a run cable with a force perpendicular to the opening, the connector will buckle and the opening remain unclosed. If the pressure is applied along the two sides of the connector legs, the connector ovalizes when crimped and the cable is flattened and damaged, an undesirable condition in a run cable.

We have thus described our invention, but we desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of our invention, and, therefore, we claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which, objects of our invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some

of the many that can be employed to attain these objects and accomplish these results.

We claim:

1. As an article of manufacture, a copper to aluminum connector for attachment to an endless metal cable comprising a connector body made of the same metal as the cable and having a lateral opening for insertion over the cable, said body having two sockets extending at right angles to said lateral opening, a U shaped conductor member made of a different metal than is the connector body and having each of its ends permanently secured in one of said sockets, said body being provided with malleable lips laterally disposed and outwardly extending from said sockets for crimping said body to said cable outside of the U shaped conductor member, said socket being located inwardly of the outer extremities of the body.

2. A connector according to claim 1 wherein said body is made in two parts, each of said parts including a socket and a malleable lip, said two parts electrically and mechanically joined together by said U shaped member.




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