Jan. 26, 1937. A. ALSAKER ET AL 2,068,639

ELECTRICAL RAIL BOND

Filed May 3, 1930

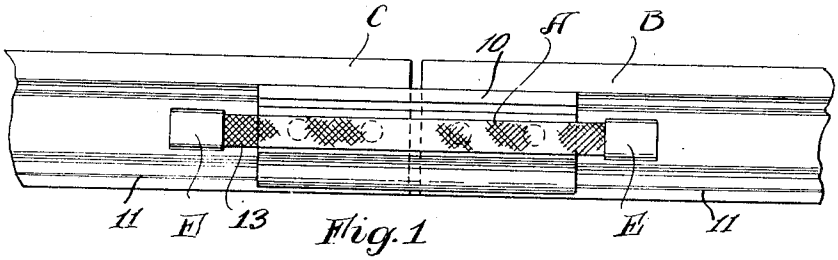

Fig. 1

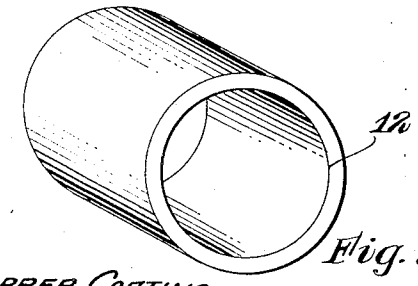

Fig. 2

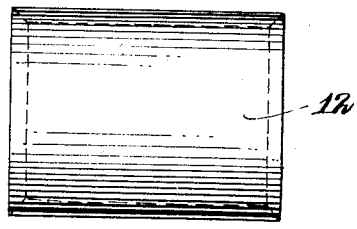

Fig. 3

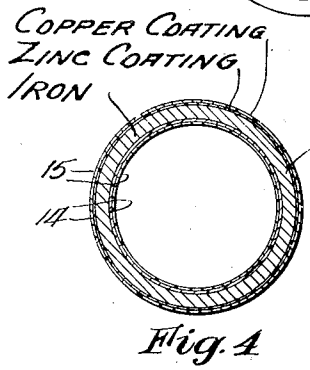

Fig. 4

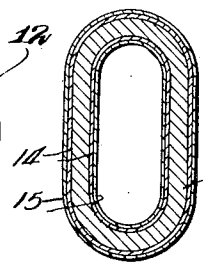

Fig. 5

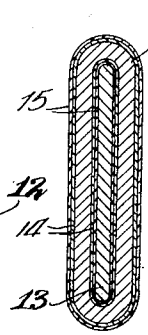

Fig. 6

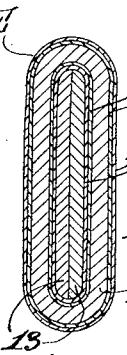

Fig. 7

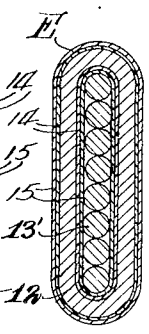

Fig. 8

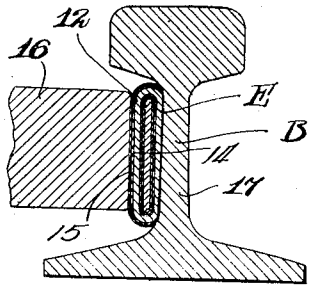

Fig. 9

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ELECTRICAL RAIL BOND

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Application May 3, 1930, Serial No. 449,522

7 Claims. (Cl. 173—278)

Our invention relates to an electrical connector between two rails to provide a rail bond which may be welded into place to form an integral connection with the rail and the bond. In this manner we provide an electrical connector between the ends of rails having a very efficient electrical conductivity and of a simple, inexpensive structure which may be easily and quickly applied to more effectively connect the rails than has been accomplished heretofore insofar as we know.

A further feature of the invention is to provide a rail bond which may be readily and economically manufactured and which will have a greater efficiency as an electrical connector between the rails than has been used heretofore. This is accomplished by a small number of parts which are virtually integrally connected together wherein we use a flexible electrical conducting braid or cable, the ends of which are bound by and contained within a sleeve which forms a connecting lug adaptable to be welded directly to the respective sections of the rail.

The invention includes the method of preparing these materials to form the rail bond or electrical connector which consists in using a metal tube, which, after being hot galvanized, is copper plated and then squeezed over the ends of the flat electrical cable or braid to form a binder and connecting lug for the ends of the same. This provides a low loss electrical bond between the rails and insures a virtually perfect electrical connection to conduct the electrical current from one rail to the other, even though the rails may be slightly spaced apart for expansion and contraction, as in railroad rails and where it is highly important to provide an efficient electrical connector between the same. Our rail bond provides an electrical connection having an efficiency, we believe, of such a nature as to virtually provide as efficient an electrical connection between the rails as if the rails were a continuous non-separated part.

These and other objects, together with a detailed description of the formation of our rail bond, will be more clearly and fully set forth in the following specification and in the claims.

In the drawing forming a part of the specification:

Figure 1 is a side elevation of our rail bond in place upon a pair of rails.

Figure 2 is a perspective view of a section of tubing composing the ends of our bond.

Figure 3 is a side elevation view of the tubing after the first operation has taken place.

Figure 4 is a sectional view of the tubing illustrated in Figures 2 and 3, after galvanizing and plating the same.

Figure 5 is a sectional view of the tubing after having been partially bent to allow insertion of braid.

Figure 6 is a sectional view of the tubing, with the braid enclosed therein.

Figure 7 is a sectional view similar to Figure 6, but illustrating a pair of braids enclosed within the flattened tube.

Figure 8 illustrates a series of wires enclosed within the tubing.

Figure 9 is a cross-sectional view of a rail and bond, showing a portion of the copper electrode of an electric welder.

The rail bond A is adapted to connect electrically a pair of track rails B and C, and may extend over the splice bar 10 mechanically connecting these rails, or may be attached adjacent the ends of the rails in case a rail clamping device attached only to the base 11 of the rails is used.

In the formation of our rail bond, we first obtain a pair of short sections 12 of tubing. Iron pipes are very suitable for composing this tubing, and may be used economically. The short sections of tubing 12 illustrated in Figure 2 of the drawing are then beveled inwardly about either end in the manner shown in Figure 3 to prevent the square inner edges of the ends of the tubing from cutting the braid when it is inserted into the tubing.

The tubes 12 are then hot galvanized to present a surface which is a good conductor of electricity, and after galvanizing, the tubing is copper plated. In this manner we provide a tube which is highly conductive of electricity, and through which electricity may be conducted with low loss.

After having been galvanized and copper plated, the tubing is partially flattened, as is shown in Figure 5 of the drawing. The flattening of the tube may be continued until the copper or galvanized wire braid 13 may be inserted into the same easily. After the insertion of the wire braid 13, the tubing 12 is flattened to virtually connect it integral with and over the ends of the braid 13. This forms a connecting lug E on the end of the braid or cable. In Figures 6, 7, and 8, may be seen the tubing 12 with a layer of galvanizing 14, a plating of copper 15, and the flexible portion 13 of the bond enclosed within the tube. Figure 6 illustrates the tubing 12 containing a single flexible braid 13. Figure 7 shows a pair of braids 13 secured within the tubing 12. Figure 8 discloses a plurality of wire strands taking the place of the braid as the flexible wire cable 13'. Other suitable conductors may be

used in place of the braid or flexible cable if desired.

Flattening of the tube is accomplished in any suitable manner, such as in a hydraulic press or by any other means suitable for squeezing the tubing rigidly into contact with the cable.

After having flattened a tube 12 to enclose each end of a short length of copper braid 13 or other flexible connector, our rail bond is in condition for use. It is then welded to the rails B and C by means of an electric spot-welding machine. In the welding process, the copper electrode 16 of the welding outfit is held as is illustrated in Figure 9 of the drawing. The bond A is placed along the side of the web 17 of the rail B with one flat side of the tube 12 forming the connecting lug in contact with the web 17. The copper electrode 16 of the welding outfit is pressed against the other side of the connecting lug E. When the current is introduced in the copper electrode, the current passes through the copper plated surface of the lug E, and as a low resistance joint is formed between the copper electrode and the copper plating of the lug E, the surface is not damaged in any way. However, the copper plated surface of the lug E in contact with the web of the rail B forms a high resistance electrical joint, and accordingly is practically instantaneously heated to a high temperature. The high temperature thus caused by the high resistance joint causes the copper plated surface 15 and the galvanized layer 14 to vaporize on the side of the lug E adjacent the rail web 17, and allows the iron lug or tube to combine with the iron or steel rail, causing an iron to iron fusion, and joining the lug securely to the surface of the rail web 17.

If the proper equipment is not available for electrically welding the connecting bond to the rails B and C, or if a proper source of electrical energy is not convenient, the bonds may be welded by the arc-welding process with much the same result as that obtained by the spot-welding process. In either case, the copper plated surface adjacent the rail is vaporized, allowing an iron to iron fusion.

Certain modifications of this process may be made, and the rail bond formed will still be constructed in accordance with our invention. If galvanized iron wire is used to form the flexible connection portion of the bond, in place of the copper braid 13 or copper wire described, the copper plating over the galvanized lug E could be dispensed with without lowering the conductivity of the connection between the wire and the surfaces of the lugs.

In accordance with the patent statutes, we have described the formation of our rail bond, and while we have endeavored to set forth the best embodiment thereof, we desire to have it understood that this is only illustrative of a means of carrying out our invention, and that obvious changes may be made within the scope of the following claims without departing from the spirit of the invention.

We claim:

1. An electrical rail bond including, a flexible conductor wire, tubular connectors of less conductive material squeezed tightly over the ends of said flexible conductor, said connectors welded to the web of a rail, and a protective coating over the entire surface of the connectors providing a good contact between said wire and said connectors, and fusible at welding temperatures over the area of the weld, but capable of withstanding the temperatures attained by the connectors over the area thereof not welded.

2. The method of forming a rail bond consisting in galvanizing the inner and outer surfaces of a tubular member, copper plating the inner and outer surfaces of the tubular member, attaching the galvanized and plated member to enclose the end of a flexible electrical cable, the galvanizing and plating forming a good electrical contact between said tubular member and said cable, supporting the attached member against a rail, bearing a welding electrode against the outer surface of said attached member to weld the same to the rail, fusing the copper plating only over the welded surface to retain the copper surface over the unwelded area.

3. An electrical rail bond including, a high electrically conductive flexible electrical cable, and end connecting lugs of relatively low conductivity formed on said cable having a copper plating entirely over the inner and outer surface thereof for engagement with said cable and a nature of metal beneath the copper plating to permit said connecting lugs to be welded directly to the railroad rail.

4. An electrical rail bond including, a highly conductive flexible copper electrical cable, end ferrules adapted to form connector lugs for said cable, said ferrules having a relatively low electrically conductive metal body over which hot galvanizing extends and copper plating over the galvanizing to provide connector lugs for said bond weldable to a rail the copper surface of the bond engageable with the copper cable.

5. A spot or arc-weldable electric rail bond having a flexible electrical cable of high electric conductivity, connector lugs on the ends of said cable, said lugs being formed of a weldable metallic base of relatively lower electric conductivity, and copper plating extending over the entire inner and outer surface of said lugs to provide a surface of high electric conductivity, said lugs being integrally connected over the ends of said cable, and said copper plating being adapted to fuse away from the surface spot-welded to the rail to integrally connect said lugs and to provide an electrical bond for rails with the entire exposed surface to the outer atmosphere protected by a high electrical conducting material.

6. A low loss electrical rail bond including, a flexible cable of high electric conductivity, hollow end connecting lugs composed of a weldable base metal, and an inner and outer protective coating of highly conductive electric material to contact said flexible cable within said hollow lugs and to cover the outer surface not welded to the rail.

7. An electrical rail bond including, a flexible cable of high electric conductivity, a pair of hollow end lugs of relatively lower electric conductivity, a coating of metal of high electric conductivity on all surfaces of said lugs, said coating within said hollow lugs contacting said cable, said coating being of a nature to vaporize along the portion of the lugs welded to the rail and to otherwise remain virtually intact.

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