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METHOD OF MAKING RAIL BONDS

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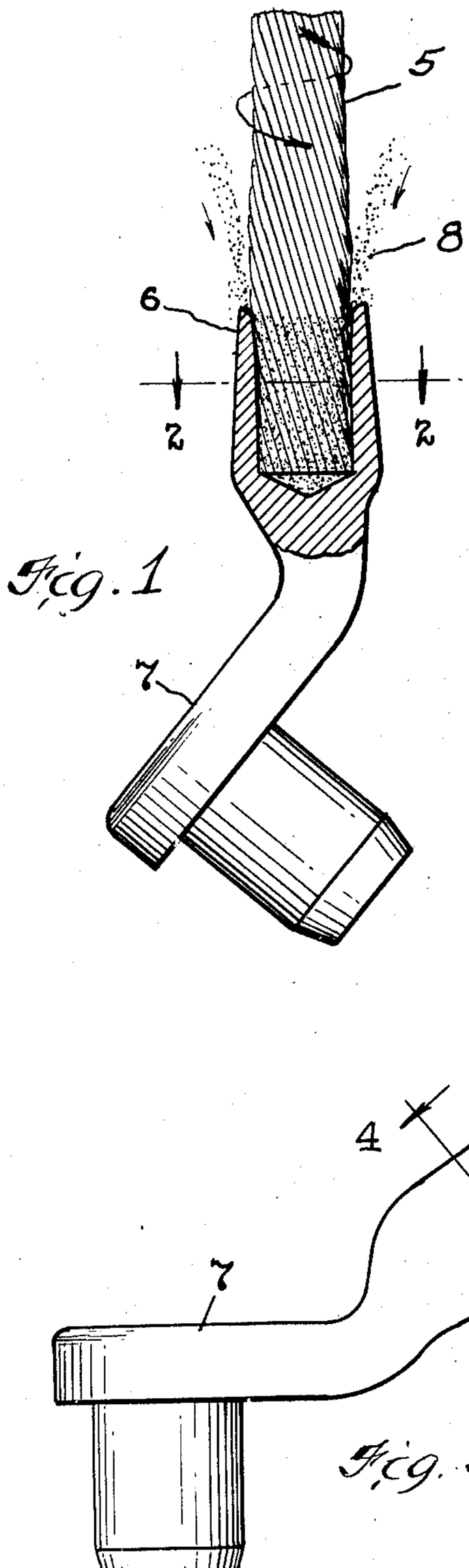

Fig. 1

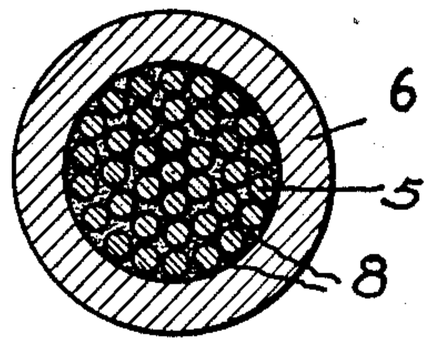

Fig. 2

Fig. 3

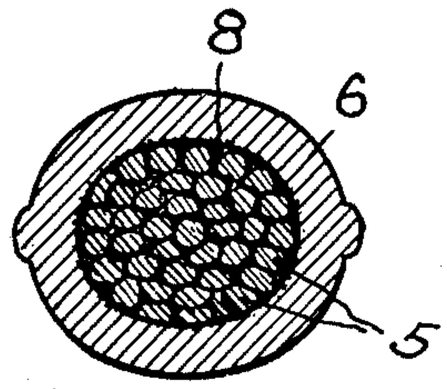

Fig. 4.

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METHOD OF MAKING RAIL BONDS

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7 Claims. (Cl. 29—155.55)

This invention relates, as indicated, to rail bonds, but has reference more particularly to rail bonds of the type in which the conductor is mechanically joined to the terminals, and to methods of manufacturing the same.

It has heretofore been proposed to mechanically join electrical conductors by means of a common sleeve, between which and the conductors to be joined is interposed a frictional material, these methods being characterized by the fact that they are confined as a rule to the joining of single wire conductors, and by the fact that the frictional material is applied as a lining to the inner surface of the sleeve and is either a non-conductor or one of high resistance. For these and other reasons, none of the methods heretofore employed have been found particularly effective for joining a stranded conductor with a short heavy terminal, as in the manufacture of rail bonds, and in which the requirements as to strength and electrical conductivity of the joints are rather severe.

The present invention has for its primary object the provision of a method of mechanically joining the stranded conductor to the terminals of a rail bond, by which method a joint of high electrical conductivity and mechanical strength is secured.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the methods and means hereinafter fully described and particularly pointed out in the claims; the annexed drawing and the following description setting forth for purposes of illustration, the invention as applied to the formation of a joint or union between the stranded conductor of a rail bond and one of the terminals of such bond.

In said annexed drawing:—

Fig. 1 shows the first step in the formation of the joint between a stranded conductor and a terminal of a rail bond; Fig. 2 is a transverse cross-sectional view of the joint, taken on the line 2—2 of Fig. 1; Fig. 3 is a view of the completed joint; Fig. 4 is a transverse cross-sectional view of the completed joint, taken on the line 4—4 of Fig. 3.

In accordance with the invention, one end of a stranded conductor 5 is inserted into tubular extension 6 of a terminal 7, which, in the present instance is in the form of a copper forging, and of the type adapted to be mechanically secured to a rail. The terminal 7 is preferably rigidly held in an upright position as shown in Fig. 1, with its lower end in a box or other receptacle containing granular material which is to be used in the process of forming the joint. The granular material is preferably a good conductor, such, for example, as an alloy of copper with aluminum, or silicon, but in the formation of joints in which good conductivity is not of importance, a material of lower conductivity may be used, such, for example, as a granulated form of carborundum, chromium or manganese.

It has been discovered that in practice, a brittle alloy of copper with, for example, aluminum or silicon, when crushed to a fineness of about 80 mesh and finer, has a granular consistency which makes it admirably adapted for the purpose at hand.

With the conductor and terminal positioned as shown, granular material 8 of the character described in the preceding paragraph is poured into the interstices between the conductor 5 and the inner wall of the tubular extension 6, the portion of the conductor immediately above the tubular extension being preferably untwisted, as indicated by the arrow in Fig. 1 during the pouring operation, so as to cause the strands of the conductor to become slightly separated from each other. As a result of this untwisting operation, the granular material will not only enter the interstices between the conductor and the wall of the tubular extension, but will also penetrate the conductor, the finer or dust-like particles entering the smaller interstices between the inner strands of the conductor end and the coarser particles filling the larger spaces, the entire mixture of various sizes completely flooding all of the spaces within the end of the conductor, as shown in Fig. 2. The twisting motion causes the strands of the conductor to breath in, as it were, the granular material, causing the latter to penetrate to the very core of the conductor.

The tubular extension 6 of the terminal is then compressed about the stranded conductor by means of dies or the like, so as to reduce the normal section shown in Figs. 1 and 2 until it assumes a form somewhat as shown in Figs. 3 and 4. The compression causes the particles adjacent the inner wall of the extension to embed themselves in said wall as well as in the strands comprising the outermost layer of the conductor and causes the remaining particles to embed themselves in the strands comprising the inner layers of the conductor, so that each strand is mechanically or frictionally joined with its adjacent strands, and the inner strands of the conductor are anchored to the outer strands.

The result is an extremely strong joint between the conductor and terminals, this joint being, in

fact, so strong that in tensile tests of rail bonds embodying such joints, the conductor usually ruptures intermediate its ends before the joints are in any way disturbed. Furthermore, when the granular material is a good conductor, it has been ascertained, as a result of various tests, that the rail bond has lesser electrical resistance than an equal length of the stranded conductor alone.

Furthermore, it will be readily understood that the invention is not confined in its application to the manufacture of rail bonds, but may be advantageously employed wherever stranded conductors or cables are to be joined to each other or to a sleeve or the like.

Other forms may be employed embodying the features of my invention instead of the one here explained, change being made in the form or construction, provided the elements stated by any of the following claims or the equivalent of such stated elements be employed, whether produced by my preferred method or by others embodying steps equivalent to those stated in the following claims.

I therefore particularly point out and distinctly claim as my invention:—

1. The method of making a joint between a stranded conductor and a tubular member, which comprises inserting an end of said conductor into said member, then introducing in the space between said conductor and member a material of good electrical conductivity and in such finely divided form that it will penetrate the spaces between the strands of said conductor, and then pressing said member into intimate engagement with said conductor.

2. The method of making a joint between a stranded conductor and a tubular member, which comprises inserting an end of said conductor into said member, introducing a granular material into the space between said conductor and member, untwisting the portion of said conductor within said tubular member during the introduction of said granular material so as to cause penetration of said material into the spaces between inner strands of the conductor, and then pressing said member into intimate contact with said conductor.

3. The method of making a joint between a stranded conductor and a tubular member, which comprises inserting an end of said conductor into said member, introducing a material of good electrical conductivity and in finely divided form into the space between said conductor and member, untwisting the portion of said conductor within said member during the introduction of said material in order to cause penetration of the particles of the material into the spaces between inner strands of the conductor, and then pressing said member into engagement with said conductor.

4. The method of making a joint between a stranded conductor and a tubular member which comprises inserting an end of said conductor into said member, then introducing into the space between said conductor and member an alloy of copper in such finely divided form that it will penetrate the spaces between the strands of said conductor, and then pressing said member into engagement with said conductor.

5. The method of making a joint between a stranded conductor and a tubular member which comprises inserting an end of said conductor into said member, introducing into the space between said conductor and member an alloy of copper, said alloy being in a form such that it will pass through an 80 mesh screen, and then pressing said member into engagment with said conductor.

6. The method of making a joint between a stranded conductor and a tubular member which comprises causing a material of good electrical conductivity and in finely divided form to adhere to the surface of and penetrate the spaces between inner strands of the conductor and then pressing said member into engagement with said conductor.

7. The method of making a joint between a stranded conductor and a tubular member which comprises applying a material of good electrical conductivity and in finely divided form to an end portion of said conductor in such a manner as to cause said material to penetrate the spaces between inner strands of the conductor and then pressing said member into engagement with said end portion of the conductor.

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