Sept. 6, 1938. E. M. DEEMS 2,129,493

RAIL BOND

Filed Dec. 15, 1932

FIG. 1.

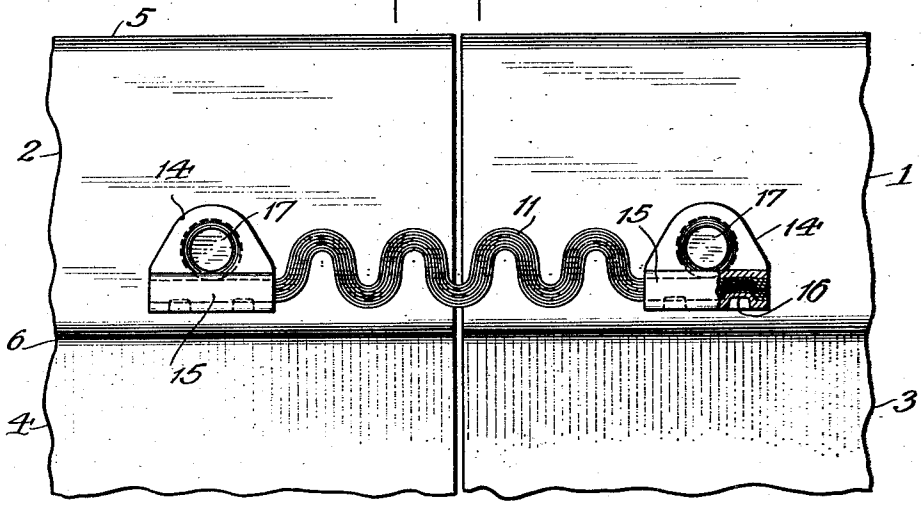


FIG. 2.

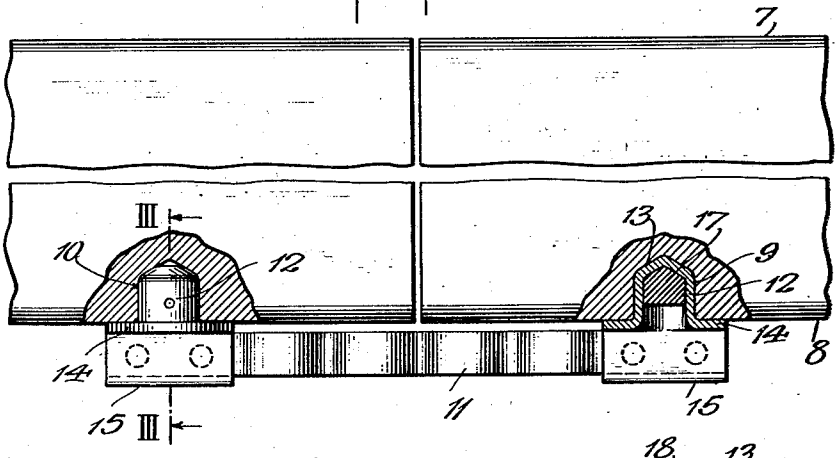


FIG. 5.

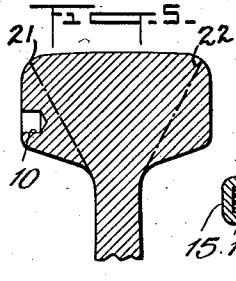


FIG. 4.

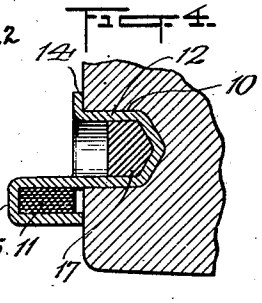
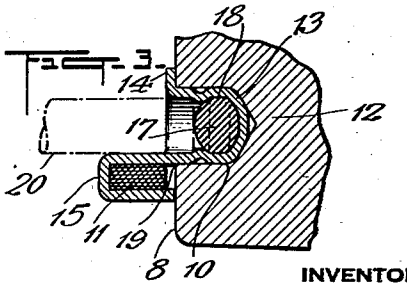


FIG. 3.



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RAIL BOND

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Application December 15, 1932, Serial No. 647,308

4 Claims. (Cl. 173—280)

This invention relates to conductors, more especially to conductors for connecting the adjacent ends of railway rails, particularly those for use in connection with railway track circuits.

It is well understood by those skilled in the railway signalling art, that a track circuit includes an insulating section of the trackway formed by placing insulating joints in each of the lines of rails, and by connecting a battery across the rails at one end, and a relay across the rails at the other end.

It is also well understood that the ordinary rail connecting or fish plates connecting the adjacent ends of the ordinary thirty-six foot sections are not to be relied upon to furnish sufficient conductivity for the electrical energy which flows in the rails from the battery at one end of the section to the relay at the other end thereof. This fact has necessitated a special bonding of each of the adjacent abutting rail ends within the section.

Great difficulties have been encountered in successfully bonding the adjacent abutting rail ends in track circuit sections because provision has to be made for many adverse conditions. A common method is to bond, from one rail web to the adjacent rail web, by means of one or a plurality of conductors of a length somewhat greater than the length of the fish plates. This method of bonding exposes the bonding wires to mechanical injury, in that, they may become entangled with dragging parts from the rolling stock, or may actually get onto the top of the rail, and so be severed by the passage thereover of the wheels of rolling stock. In addition, they are very likely to be damaged by track men while working along the track, particularly when working in and about the rail joint, and more especially when tightening the bolts thereof, or replacing the fish plates with new plates.

A very pronounced difficulty with the old type of bond is, that due to its length and in spite of its size as it may be commercially used, it does not offer a conductivity as great as is desired. The desired conductivity cannot be attained without enlarging the bond to a prohibitive extent.

Attempts have been made to increase the conductivity and decrease the mechanical disadvantages of bonds by applying a bond directly to the rail heads. Such a bond can be very short, as compared with the previously described bond, therefore, for a given diameter has an increased conductivity in that it has less resistance. Such bonds have, in general, been applied to the head of the rail by electrical or flame welding. Many competent engineers are adverse to applying any considerable degree of heat to the side of the ball of a rail, especially adjacent the end thereof, and this reluctance, considered by many to be well founded, has militated against the use of such bonds.

A further difficulty which has been met with in the type of bond applied directly to the rail heads is that it is particularly exposed to injury by snow ploughs and ballast spreaders. Both of these devices, and especially the ballast spreader, have parts which extend below the top surface of the head of the rail on the outside thereof. These parts, due to the swaying of the vehicle, come in contact with the head of rail bonds and destroy them.

Attempts have been made to attach bonds to rail heads by drilling a cavity in the rail head and attaching the bond to a plug driven into the cavity. A difficulty with this type of bond arises from the fact that it is necessary to drill a relatively deep hole in the head of the rail. This hole penetrates what might be called the active load bearing cross-sectional area of the head and to that extent weakens the rail head.

In my copending application Serial No. 538,943, filed May 21, 1931, now matured into Patent No. 2,045,229 I have illustrated, described and claimed a type of bond for attachment to rail heads. This type of bond obviates many of the defects of the types of bonds heretofore used and has many desirable virtues especially in that the cavity which must be formed in the head of the rail for the reception thereof is so shallow that it does not penetrate the active load sustaining cross-section of the rail. By reason of this fact, incipient cracks which may develop in the rail head are not afforded an easy opportunity to spread by reason of the cavity formed for the reception of the head of the rail bond, as that cavity does not closely approach the point of origin of the cracks.

I have discovered, in practice, that the type of bond illustrated and described in my copending application, hereinbefore referred to, has a weakness in that it is subject to injury at the junction line of the surface in which the cavity is produced and the bond. This weakness has been cured by me through the adoption of the structure of bond as shown by my copending application Serial No. 600,595, filed March 23, 1932.

A principal object of this invention is to provide a bond of the type illustrated, described and claimed in my copending applications herein-

before mentioned, of such construction that it will have the desirable virtues of the specific constructions of the prior application, and in addition will have desirable virtues not possessed by the prior forms.

A further object of this invention is to provide a bond of the type specified which will be so constructed that greater weight of metal may be provided in that portion of the bond which is inserted in a cavity of a rail head.

A further object of the invention is the production of a bond of the type specified which will be so constructed that less leverage or strain will be developed on a flange portion of the bond positioned outside of a cavity in a rail head, and a greater thickness of metal may be provided at the point where the stress is greatest to resist the action of the stress.

Other objects and advantages will appear as the description of the particular physical embodiment selected to illustrate the invention progresses and the novel features will be particularly pointed out in the appended claims.

In describing the invention in detail and the particular physical embodiment selected to illustrate the invention, reference will be had to the accompanying drawing and the several views thereon, in which similar parts will be designated by similar characters throughout the several views, and in which:

Figure 1 is an elevational view of two abutting rail ends with a device of my invention in place thereon; Fig. 2 is a top plan view of the device as shown by Fig. 1, but with certain parts broken away, and other parts in section to more clearly illustrate the construction; Fig. 3 is an enlarged, fragmentary, cross-sectional view of the device, as shown by Fig. 2, on the plane indicated by the line III—III of Fig. 2, viewed in the direction of the arrows at the ends of the line: Fig. 4 is a view corresponding to that as shown by Fig. 3, but showing the completion of the affixing of the bond in a rail cavity, Fig. 5 is a view exhibiting the strain area of a rail.

Numerals 1 and 2 designate two adjacent rail ends. These rails are shown in elevation in Fig. 1 and in plan in Fig. 2. The webs are 3 and 4 and the heads, in the elevational view, extend between the lines 5 and 6. As shown in Fig. 2, the flange side of the rail is designated 7 and the outside edge is designated 8.

In order to electrically bond the rails 1 and 2 in accordance with my invention, I first form shallow cavities 9 and 10 in the heads of the rail from the outside face thereof. These shallow cavities may be formed, and are preferably formed by the use of an ordinary drill. These cavities are so shallow as to lie entirely without or substantially entirely without what might be called the active load bearing cross-section of the rail, that is, that portion of the cross-section of the rail least active in sustaining the stresses of a passing train. To this end applicant not only forms the cavities 9 and 10 very shallow, but also forms the cavities well down upon the side of the head of the rail, as most clearly shown by Fig. 1. As shown by Fig. 5 the cross-sectional area of the rail which bears the load is compressed between the dot and dash lines 21 and 22. The cavity 10 formed by applicant in the rail head may be entirely without the strain area, as clearly shown by the diagram, although even if it encroached slightly upon the strain area, it would not be highly objectionable.

In order to attach the ends of the conductor 11 to the several rail heads, applicant employs a thimble, as 12, at each end of the conductor. This thimble 12 is formed substantially as an annulus with an end wall. The outside diameter of the thimble is such that it just snugly fits into the cavity 9 produced in the rail head. The end wall 13 of the thimble, as shown in Fig. 3, is slightly rounded as made in practice, that is, it is not made with a sharp conical point which will exactly fit into the end of the cavity of the rail head, the cavity in the rail head being made preferably by the use of an ordinary and common form of drill, which produces a cavity with a conical point, as shown in Figs. 2, 3 and 4.

The thimble 12 has formed, preferably integral therewith, a rim or flange 14 which is formed into a holder for the conductor portion of the bond. This rim or flange portion, as best shown in Figs. 3 and 4, is formed into a channel 15 within which the conductor portion of the bond is positioned. In order to secure the conductor portion 11 of the bond securely within channel 15, applicant may attach the parts together in any well known and approved manner but prefers to drive the metal of the channel into the metal of the member 11 as best shown at 16. It is also desirable to securely solder the parts together in any well known or approved manner so that a very firm mechanical and electrical joint is made between the conductor 11 and the channel 15.

In order to retain the thimble 12 within the cavity 9 of the rail 1, applicant employs a plug 17, best shown in its original form in Fig. 3. This plug, in the form shown, is circular in cross-section in a plane taken parallel to the conductor 11, it is, in the form shown in Fig. 3, slightly greater in diameter than its length from end to end measured along the axis of the thimble, and for this reason I call it a disc. In the preferred form, as shown in Fig. 3, one end of the disc is a truncated cone, and the other end is a hemisphere.

Although applicant has illustrated his plug 17 in the most preferred form now known to him, nevertheless it is to be understood that the plug 17 is, in essence a disc, and may well serve the purpose of applicant if made in a more simple and less complex form.

By reference to Fig. 3 it will be seen that the outside line 18 of greatest diameter of the plug 17 is inward of the line 8 of the face of the rail head, that is, it is inward of the line 19 of the junction of the edge of the cavity and the thimble. Careful study and experimentation with this type of bond has shown applicant that fracture or incipient fracture is likely to occur at the junction line 19. In order to avoid this possible defect, applicant has formed his plug as shown in the drawing, which form is characterized by the fact that the most outward line of greatest diameter is always inwards of the edge or line 19.

With the type of plug as shown by Fig. 3, firm connection between the rail and the thimble and the plug is secured by first inserting a suitable cylindrical tool as 20 within the thimble 12 and then forcing it with great pressure, as by striking with a hammer against the plug 17. The result of this operation is to force the plug 17 and the thimble 12 into the form as shown by Fig. 4. When the parts are in the condition as shown in Fig. 4, the thimble 12 is forced tightly against the inside surface of the cavity 10, and the plug 17 is forced tightly against the inside surface of the thimble 12, and against the surface of the end wall 13.

In forcing the plug 17 into the form as shown by Fig. 4, no pressure whatsoever has been brought upon the shell of thimble 12 along the line 19 so that there has been no tendency to fracture the thimble along this line.

The hereinbefore described bond is very short and consequently has a relatively large electrical conductivity compared to its total weight. This corrugated form, as shown by Fig. 1, provides for ample expansion and contraction due to changes of temperature or displacement of the rails. Its laminated structure provides extreme flexibility. The thimble members 12 are readily attached to the conductor portion 11 and the thimble portion 12 being preferably formed of a high conductivity metal such as copper is readily welded, or soldered, or cold welded, as by driving the metal of one portion into that of the other, and due to the channel portion 15, the laminae are firmly held together on the end mechanically thus neutralizing the force tending to cause the laminae to spread. The contact between the outside of the thimble and the inside surface of the cavity is intimate and of such a nature as to effectually prevent the entrance of moisture. Excessive pressure is not needed upon the plug 17 to perform the function of driving the thimble into intimate contact with the inner surface of the cavity, because the plug 17 is made of fairly soft copper which not only is very malleable but is a metal which will resist corrosion so that if the plug has been driven firmly into place, as shown by Fig. 4, corrosion will not take place between the plug and the sleeve so as to decrease the constant pressure exerted by the plug to keep the shell in electrical contact with the inside surface of the cavity in the rail.

The bond hereinbefore described is of a form such that there is less strain on the thimble as the conductor proper hangs from the contact and does not project outwardly from the upper portion, and also because the weight of the parts outside of the cavity is not as great as the prior forms of bonds.

Because the thimble is not completely surrounded by a very large annulus for receiving the conductor proper, the walls of the thimble may be made thicker and of greater uniformity in thickness because the metal does not have to be drawn so much as in the prior forms of bonds.

The conductor proper sits lower down on the side of the rail head than prior forms and consequently is not so likely to be struck by dragging parts of rolling stock.

Although I have particularly described one particular physical embodiment of my invention and explained the construction, principle, and mode of operation thereof, nevertheless, I desire to have it understood that the form selected is merely illustrative but does not exhaust the possible physical embodiments of the idea of means underlying my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A metal rail bond comprising a thimble-like body so constructed and arranged as to be expandible within a complemental recess, said body having a closed inner end and an open outer end, and an enlarged rim portion surrounding the open end of said body and integral with the body, said rim portion having an elongated conductor-engaging part arranged tangentially with respect to the annular wall of the thimble, and positioned forwardly with respect to the plane of the open end thereof, said tangential part having a longitudinally disposed return bend terminating in a free edge and so constructed and arranged as to provide a conductor-receiving recess.

2. A metal rail bond comprising a thimble-like body so constructed and arranged as to be expandible within a complemental recess, said body having an inner closed end and an outer open end, and an enlarged rim portion surrounding said open end and integral with the body, said rim portion having a flange-like part disposed at an angle to the axial line of said body and an elongated part disposed approximately tangentially with respect to the bore of the body, and located forwardly with respect to the plane of the open end of the thimble, said elongated part having a return bend provided with a free edge so disposed with respect to the main portion thereof as to provide a conductor-receiving space.

3. In a railway bond, in combination, a conductor, anchor devices, one for each end of the conductor, said anchor devices each comprising a thimble-like body so constructed and arranged as to be expandible within a complemental recess, said body having a closed inner end and an outer open end, and an enlarged rim portion surrounding said open end and integral with the body, said rim having an elongated conductor engaging part arranged approximately tangentially with respect to the annular walls of the thimble, and located forwardly with respect to the plane of the open end thereof, said tangentially arranged portion having a longitudinally disposed return bend provided with a free edge so constructed and arranged as to provide a conductor-receiving recess, the ends of said conductor being engaged by the respective conductor-receiving recesses, and deformable plugs, one fitting within each thimble and each so constructed and arranged that axial pressure exerted against the plug will expand it radially, thereby binding its thimble mechanically and electrically to the wall of said recess.

4. A metal rail bond comprising a thimble-like body of sheet metal so constructed and arranged as to be expandible within a complemental circular recess, said body having an inner closed end, a circular outer open end, and an enlarged rim portion surrounding said open end and integral with the body, said rim portion having a flange-like part disposed at an angle to the axial line of said body and adapted to be seated flatly upon the surrounding margin of the rail recess, and an elongated part disposed approximately at a tangent to the bore of the body, said elongated part being located forwardly with respect to the plane of the open end of the thimble and extending from its region of tangency with the thimble to a sensible distance in parallelism with the major axis of the bond, and having a return bend provided with a free edge so disposed with respect to the main portion thereof as to provide a conductor receiving space.

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