

Jan. 31, 1928.

A. E. HUDD ET AL

1,657,675

IMPEDANCE BOND FOR RAILWAY SIGNALING SYSTEMS

Filed Jan. 2, 1926

2 Sheets-Sheet 1

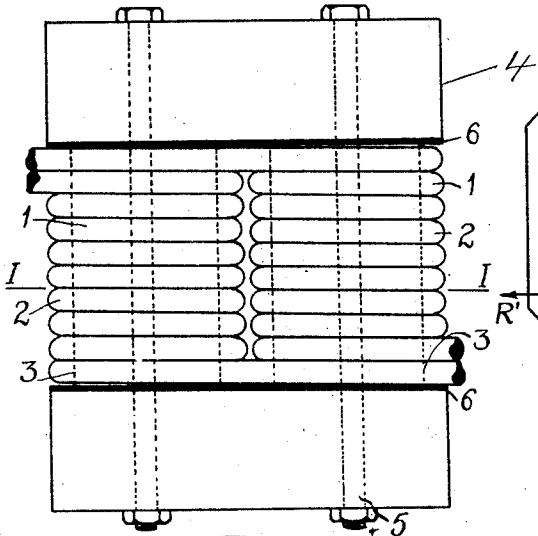


FIG. 1.

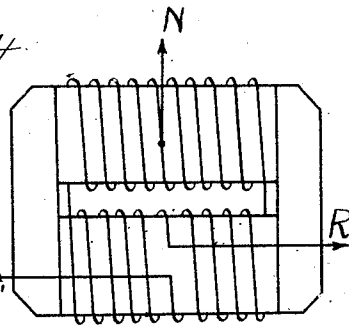
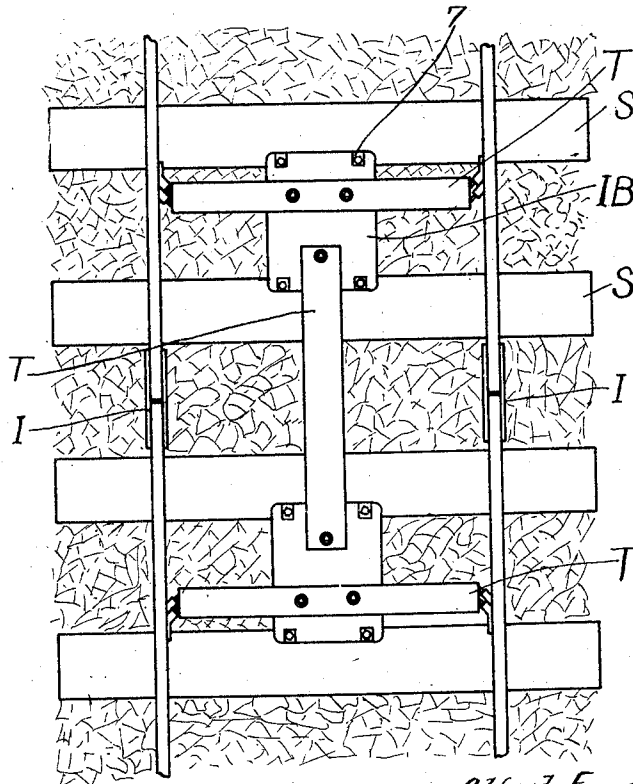


FIG. 2.



Inventors.
Alfred Ernest Hudd
and Philip Norton Roseby
By *Lucie Forrester*, Attorney

Jan. 31, 1928.

A. E. HUDD ET AL

1,657,675

IMPEDANCE BOND FOR RAILWAY SIGNALING SYSTEMS

Filed Jan. 2, 1926

2 Sheets-Sheet 2

FIG. 4.

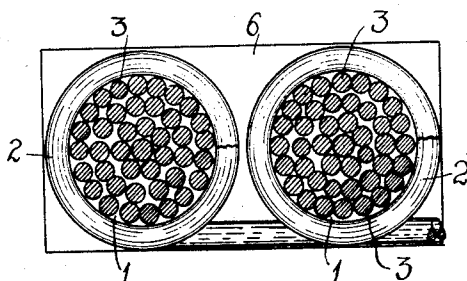
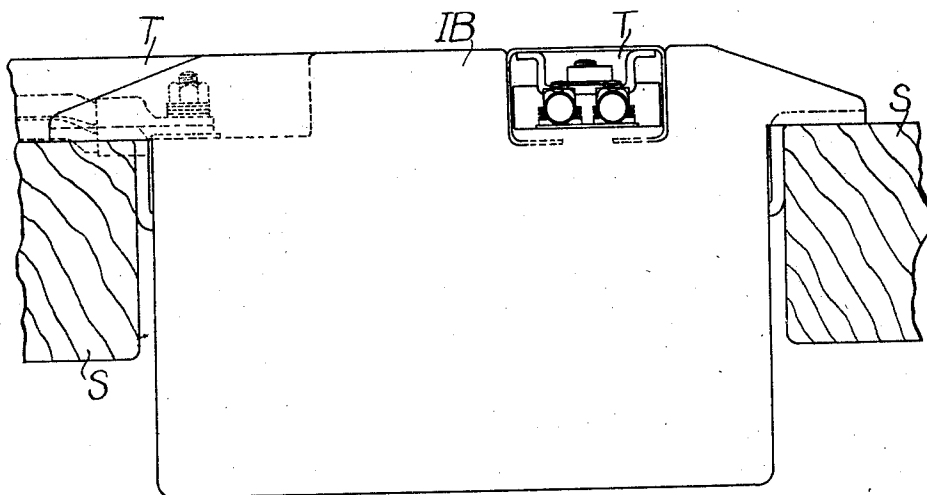


FIG. 5.



Inventors:

Alfred Ernest Hudd
and Philip Norton Roseby

By *Lincoln*
Attorney.

UNITED STATES PATENT OFFICE.

ALFRED ERNEST HUDD AND PHILIP NORTON ROSEBY, OF LIVERPOOL, ENGLAND, ASSIGNORS, BY MESNE ASSIGNMENTS, TO AUTOMATIC ELECTRIC INC., OF CHICAGO, ILLINOIS.

IMPEDANCE BOND FOR RAILWAY SIGNALING SYSTEMS.

Application filed January 2, 1926, Serial No. 78,862, and in Great Britain May 19, 1925.

This invention relates to improvements in impedance bonds for railway signaling systems and is an improvement in or modification of the invention described in the specification of British Letters Patent No. 218,826.

In that specification, an impedance bond is described in which the magnetic core consists of a number of straight rods or strips of Swedish iron or like magnetic material and of sufficient length to enable the exciting coils of standard copper wire to be wound thereon in a single helix, the bond being embedded in concrete preferably reinforced so as to form a rectangular block adapted to fit between the rails. Impedance bonds as is well known are provided for the purpose of permitting the flow of direct current from one block section to another while preventing the shunting of the alternating current track circuit apparatus in the sections.

For this reason, and as in the British patent, each of the impedance bonds has two windings having two ends connected together while the other two ends are connected respectively to the two rails of one section. The ends connected together are connected to similar joined ends of the impedance bond connected across rails of the adjacent section so that direct current flows through the two windings in parallel while the alternating current is prevented from being short circuited due to the impedance of the two coils in series across the rails.

The impedance bond constructed according to the British Patent 218,826 when secured to the sleepers between two rails has the disadvantage that it is difficult for workmen to readily reballast the permanent way. The impedance bond according to the present invention is designed to overcome this difficulty and for this purpose its construction is modified so as to include two separate cores instead of a single core.

In order that the invention may be clearly understood and readily carried into effect, an impedance bond constructed in accordance with the present invention will be fully described with reference to the annexed drawings in which:

Figure 1 shows a front view of the impedance bond with its protecting concrete case removed,

Figure 2 shows the method of connecting up the windings.

Figure 3 shows the method of connecting two impedance bonds between sections of the track.

Figure 4 shows a section on the line I—I of Figure 1.

Figure 5 shows a side view of the bond in position on the sleepers.

The impedance bond has been constructed with two separate cores 1 consisting of a number of Swedish iron rods 3, preferably of circular section having a diameter of approximately $\frac{3}{8}$ "', secured together so as to form a straight core also of circular section, and arranged parallel to each other. The ends of each core with the exception of one rod are machined flat. The windings 2 are formed of solid copper rod having a diameter of approximately one inch if required to carry 1000 amperes. The yoke members 4 which connect the cores 1 together magnetically, consist of a number of $\frac{1}{8}$ " plates of annealed magnetic material of rectangular shape suitably bolted together and secured to the cores 1 by the projecting rods 3 which pass through the yokes 4 so as to form bolts 5. Between the cores 1 and the yoke members 4, a thin sheet of insulating material 6 is inserted to provide a minimum air gap. The solid copper rod 2 is wound round each core in a single helix, the two ends being welded or soldered together. The central point of the winding on one core is then cut and the two ends thus formed are brought out to binding posts or are directly welded to an appropriate cable, while an appropriate cable is also welded to the central or neutral point of the other winding.

The whole impedance bond is then imbedded in a concrete case, preferably reinforced to form a block which can be conveniently secured to the track sleepers. The impedance bond has a closed magnetic circuit as can be seen from Figure 2. In this figure the points R and R' are riveted to the two rails of the track while the point N is welded or riveted to the corresponding point of the next impedance bond.

Referring to Figure 3 it will be seen that the impedance bond B in its concrete case rests between adjacent sleepers S and that its protecting edges rest on each sleeper and are

secured thereto by bolts 7. This construction permits the reballasting of the permanent way to be readily effected.

In order to protect the cables connecting the rails of the track and those between the impedance bonds they are contained in steel troughs. These troughs T are sunk into the concrete flush with the top of the bond and are held in place by an expansion bolt which extends down into the concrete block. The nuts for these bolts are of a triangular shape, as shown in Fig. 3, they being made this way to prevent unauthorized persons from obtaining access to the bonds. The two sections of the track are shown insulated from each other by the insulators I.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. An impedance bond for use in railway signaling systems comprising two parallel cores consisting of Swedish iron rods having windings of solid copper rod wound thereon in a single helix and the magnetic circuit completed by yoke members secured to the ends of the cores.

2. An impedance bond as claimed in claim 1, in which one core is provided with a continuous winding from end to end and the other core with a winding open at its centre, the ends of the windings on each core being connected together while the centre of the continuous winding is adapted to be connected to the centre of a similar winding of another impedance bond and the ends of the open winding to the rails.

3. An impedance bond as claimed in claim

1 in which the yoke members are secured in position by arranging one or more of the Swedish iron rods to serve as bolts.

4. An impedance bond as claimed in claim 1 provided with a concrete case having projections adapted to rest on adjacent sleepers so as to be secured thereto while the impedance bond itself is adapted to lie between the two sleepers in the centre of the track.

5. The combination with a railway both track-rails of which are divided by insulation to form block-sections, of an impedance bond comprising two parallel cores of magnetic material each having a winding thereon, yoke members connecting said cores in a manner to form a complete magnetic circuit, leads for connecting said bond with the track rails and with another bond, and metal covers for protecting said bond and leads.

6. The combination with a railway both track-rails of which are divided by insulation to form block-sections, of an impedance bond secured in a bed of concrete and means comprising steel troughs for covering the connections extending between the bonds and between the bonds and track rails.

7. The combination with a railway both track rails of which are divided by insulation to form block sections, of impedance bonds secured in beds of concrete which are in turn secured to adjacent sleepers, and of means for covering the connections extending between the bonds and track way rails.

In testimony whereof we affix our signatures.

ALFRED ERNEST HUDD.
PHILIP NORTON ROSEBY.