

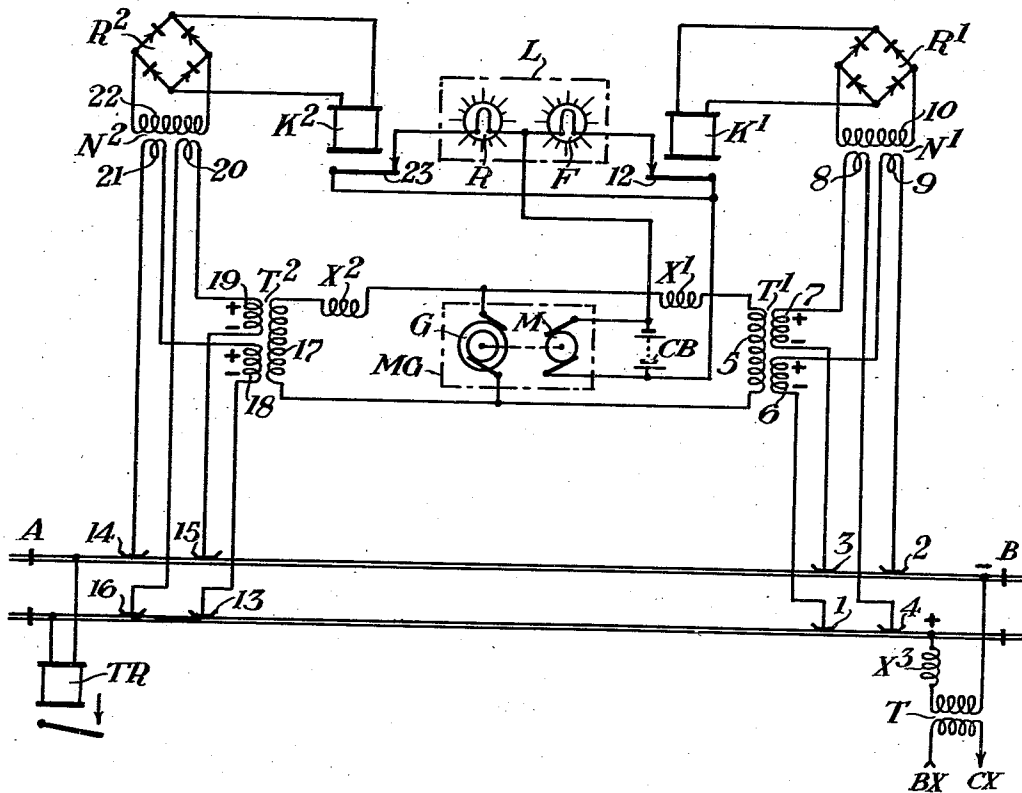
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TRACK-SHUNTING APPARATUS

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TRACK SHUNTING APPARATUS

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My invention relates to track shunting apparatus, and more specifically to apparatus for shunting of track circuits by light weight rail vehicles equipped with steel wheels or with pneumatic tired wheels.

I will describe one form of track shunting apparatus embodying my invention, and will then point out the novel features thereof in claims.

The track shunting apparatus set forth in my present application is somewhat similar to that set forth in the copending application of Howard A. Thompson, Serial No. 629,030, filed on August 16, 1932, for Apparatus for decreasing rail contact resistance, and the said copending application contains claims which cover broadly certain features of the invention described in my present application.

The accompanying drawing is a diagrammatic view showing one form of track shunting apparatus embodying my invention, as applied to an alternating current track circuit.

Referring to the drawing, I have shown a section of railway track A—B provided with a track relay TR at one end and having a track transformer T and a series reactor X³ at the other end of the section. The remaining apparatus which is illustrated is arranged to be carried on the rail vehicle.

The reference character MG designates a motor generator set comprising an alternating current generator G driven by a motor M which receives current from the car battery CB. The transformer T¹ at the forward end of the car has a primary winding 5 supplied with current from generator G, and two secondary windings 6 and 7 having substantially the same number of turns. Winding 6 is connected across the two rails of the track by means of suitable contact shoes 1 and 2. Similarly, winding 7 is connected to the rails by means of contact shoes 3 and 4. It will be noted that the polarities of these two windings are so chosen that with the instantaneous polarities as indicated, the voltages of the windings will be series-aiding and will be effective in causing a current to flow over a path which may be traced from the plus terminal of winding 6, winding 9 of transformer N¹, contact shoes 2 and 3, winding 7, winding 8 of transformer N¹, contact shoes 4 and 1, to the minus terminal of winding 6. Therefore, the voltage of both windings 6 and 7 will be effective in breaking down any resistance film which may exist between the contact shoes and the rails. It will be noted, however, that any shunt current flowing between the two rails and supplied by transformer T will

flow through windings 6 and 7 in opposing directions, thereby neutralizing the reactance of these windings and hence decreasing the shunt path impedance to a minimum value.

In series with windings 6 and 7 are connected the primary windings 8 and 9, respectively, of an indication transformer N¹, which, when energized by the rail film break-down current cause a voltage to be induced in the secondary winding 10 which is used to energize a direct current indication relay K¹ through the rectifier R¹. Windings 8 and 9 are so connected that the fluxes caused by the current supplied from windings 7 and 6 aid one another, whereas the fluxes through these windings resulting from the shunt current flowing between the two rails oppose one another, with the result that the reactance of windings 8 and 9 is neutralized to decrease the impedance of these windings in an analogous manner to that occurring in the case of windings 6 and 7. When the film between the contact shoes and the rails is broken down, the voltage induced in winding 10 will be sufficiently high to maintain relay K¹ energized, thereby closing an energizing circuit for the forward lamp F of indicator L, to provide a visual indication to the car operator that the apparatus is providing a safe shunt to the track circuit.

The purpose of reactor X¹ in series with winding 5 of transformer T¹ is to limit the maximum film breakdown current which can flow, in order to economize the output of generator G and consequently decrease the drain on the car battery CB.

At the rear end of the car is provided a duplicate set of track shunting apparatus so that adequate shunting protection will be available when the car is bridging insulated rail joints. The apparatus at the rear end of the car operates the rear indicating lamp R which provides a visual indication that this apparatus is functioning properly to shunt the track. At such times as the car is not bridging a rail joint, the apparatus at the rear end of the car provides increased shunting protection to the track circuit by making additional shunt paths effective for deenergizing the track relay.

The frequency of the current supplied by generator G should be sufficiently far removed from the frequency of the track circuit source BX—CX to prevent false response of the track relay TR. It is not essential that alternating current be used for energizing windings 5 and 17 of transformers T¹ and T², as interrupted direct current, or periodically varied current can

also be used for inducing a film breakdown voltage in the secondary windings of transformers T¹ and T².

It will be apparent that because of the neutralizing action of the fluxes caused by the shunt currents which flow in windings 6, 7, 8 and 9, the impedances of the shunt paths from rail to rail will consist chiefly of the resistances of the windings and their connections. Therefore, the shunting protection provided by the apparatus when used on an alternating current track circuit is substantially as effective as the protection which this apparatus will provide on a direct current track circuit, thereby eliminating the necessity for using a separate system for each type of track circuit.

Considering the rail connections or windings 6 and 7 of transformer T¹, it will be noted that rail shoes 1 and 2, and 3 and 4 of the respective windings are not opposite each other with respect to the two rails, but are staggered in position. The purpose of this arrangement is to prevent feed-over from one track circuit to another when insulated rail joints are located between the rail shoes. For example, assuming insulated rail joints to be located between shoes 1 and 4, and 3 and 2, it will be apparent that no closed electrical circuit from rail to rail will be made through either of windings 6, 7. Therefore, there will be no transfer of current from one track circuit to another by means of the inductively coupled windings 6 and 7, thereby preventing possible false energization of a track relay by current from an adjoining track circuit.

Although I have herein shown and described only one form of track shunting apparatus embodying my invention, it will be understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, a transformer on said vehicle having a primary winding energized from said source and having two secondary windings each of which is connected across the two rails of the track by means of rail contacts, the instantaneous polarities of said contacts associated with either rail being opposite so that the voltages of said two windings will aid each other in breaking down the rail contact resistance to improve shunting of said track.

2. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, a transformer on said vehicle having a primary winding energized from said source and having two secondary windings each of which is connected across the two rails of the track by means of rail contacts in such manner that the voltages of said two windings are series-aiding for causing a current to flow over a circuit which includes one of said two windings, one pair of rail contacts and the rail portion therebetween, the other of said two windings, and the other pair of rail contacts and the rail portion therebetween, said current acting to break down the rail contact resistance to improve shunting of said track.

3. In combination with a rail vehicle and a stretch of railway track, a source of alternating current track circuit energy and a track relay for said stretch, another source of alternating

current on said vehicle of such character as to be incapable of operating said track relay, and a transformer on said vehicle having a primary winding energized from said other source and having two secondary windings each of which has substantially the same number of flux linkages, the voltage of each of said two windings being applied across the two rails of said track by means of rail contacts for breaking down the rail contact resistance, and the connections of said two windings being so arranged that shunt currents from said track circuit source passing from one to the other rail through said rails contacts will flow in opposing directions in said two windings, thereby tending to neutralize the reactance thereof for decreasing the shunt impedance to effect release of said track relay.

4. In combination with an alternating current track circuit, two shunting paths from one to the other rail of the track each of which includes a pair of rail contacts and a winding energized inductively from a source of varying current for breaking down the rail contact resistance, said windings being linked magnetically and wound in such directions that the alternating track circuit current flowing from one to the other rail will set up opposing fluxes in said two windings thereby decreasing the shunt impedance thereof to increase the effectiveness of said two track shunting paths.

5. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, a transformer on said vehicle having a primary and two secondary windings; and four connections, one from the positive terminal of one of said two windings to one rail of said track, a second from the negative terminal of said one winding to the other rail, a third from the positive terminal of the other of said two windings to said other rail, and a fourth from the negative terminal of said other winding to said one rail of the track, whereby rail contact resistance breakdown current will flow over a series circuit which includes said two windings and said four rail connections, and whereby two paths will be effective for shunting the track, each path including one of said two windings and the two rail connections associated therewith.

6. Apparatus for shunting an alternating current track circuit comprising in combination, a rail vehicle, a source of varying current on the vehicle of such character as to be incapable of operating said track circuit, a transformer on the vehicle having a primary winding energized from said source, a reactor in series with said primary winding, two secondary windings on said transformer; a first pair of rail contacts, one for each rail, one contact being connected with the positive terminal and the other contact being connected with the negative terminal of one of said two secondary windings; a second pair of rail contacts, one for each rail, connected with the other of said two secondary windings in such manner as to impress a voltage from rail to rail of opposite polarity to that impressed by said one winding; an indication transformer having two primary windings and a secondary winding, one of said two primary windings being connected in series with one of said two secondary windings and the other of said two primary windings being connected in series with the other of said two secondary windings in such manner that the currents supplied

by said two secondary windings to said two primary windings will set up cumulative fluxes in said indication transformer, and an indicator energized from the secondary winding of said indication transformer.

7. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, a transformer on said vehicle having a primary winding energized from said source and having two secondary windings each of which is connected across the two rails of the track by means of rail contacts, the instantaneous polarities of said contacts associated with either rail being opposite so that the voltages of said two windings will aid each other in breaking down the rail contact resistance to improve shunting of said track, the rail contacts associated with each of said two windings occupying a staggered position with respect to a line at right angles to the track thereby preventing the transfer of energy around an insulated rail joint at such times as the rail joint is located between a pair of said rail contacts.

8. In combination with a rail vehicle and a stretch of railway track, a source of varying current, a transformer having a primary winding connected with said source and having two secondary windings; and means for applying a rail film breakdown potential from one of said secondary windings across the two rails of said track at a first pair of rail contacts and for applying a rail film breakdown potential from the other of said secondary windings across said two rails at a second pair of rail contacts.

9. In combination with a rail vehicle and a stretch of railway track, a source of current, two windings linked magnetically with each other, means for energizing said windings from said source, and means for applying a rail film breakdown potential from one of said windings across the two rails of said track at a first pair of rail contacts and for applying a rail film breakdown potential from the other of said secondary windings across said two rails at a second pair of rail contacts.

10. In combination with a stretch of railway track, a source of current, two pairs of rail contacts, each pair included in a shunt path from one to the other rail of said track, and means for applying a rail film breakdown potential from said source across one of said contact pairs in one direction and across the other of said contact pairs in the reverse direction, whereby rail current will flow between the contacts associated with each rail for breaking down the rail contact resistance to aid shunting of said track.

11. In combination with a stretch of railway track, two pairs of rail contacts, each pair included in a shunt path from one to the other rail of said track, and means for applying a rail film breakdown potential across one of said contact pairs in one direction and across the other of said contact pairs in the reverse direction, whereby rail current will flow between the contacts associated with each rail for breaking down the rail contact resistance to aid shunting of said track.

12. In combination with a stretch of railway track, two pairs of rail contacts, each pair included in a shunt path from one to the other rail of said track and the contacts of each pair occupying a staggered position with respect to a line at right angles to the track, and means for applying a rail film breakdown potential across one of said contact pairs in one direction and

across the other of said contact pairs in the reverse direction, whereby rail current will flow between the contacts associated with each rail for breaking down the rail contact resistance to aid shunting of said track.

13. In combination with a stretch of railway track, two pairs of rail contacts, each pair included in a shunt path from one to the other rail of said track, means for applying a rail film breakdown potential across one of said contact pairs in one direction and across the other of said contact pairs in the reverse direction, whereby rail current will flow between the contacts associated with each rail for breaking down the rail contact resistance to aid shunting of said track, and means for limiting said breakdown current when said contact resistance has been broken down.

14. In combination with a stretch of railway track, two pairs of rail contacts, each pair included in a shunt path from one to the other rail of said track, means for applying a rail film breakdown potential across one of said contact pairs in one direction and across the other of said contact pairs in the reverse direction, whereby rail current will flow between the contacts associated with each rail for breaking down the rail contact resistance to aid shunting of said track, and an impedance for decreasing said film breakdown potential when said contact resistance has been broken down.

15. In combination with a rail vehicle and a stretch of railway track, a source of current on the vehicle, a track shunt, means for applying a rail film breakdown potential from said source across the rail contacting portions of said track shunt to break down the rail contact resistance, and an impedance for limiting the amount of breakdown current flowing from said source when said contact resistance is broken down.

16. In combination with a rail vehicle and a stretch of railway track, a source of current on the vehicle, a track shunt, means for applying a rail film breakdown potential from said source across the rail contacting portions of said track shunt to break down the rail contact resistance, and a reactor inserted between said source and said means for limiting the amount of breakdown current flowing from said source when said contact resistance is broken down.

17. In combination with a stretch of railway track, a source of varying current, transformer means energized from said source and having two windings, and means for applying a rail film breakdown potential from one of said windings across the two rails of said track at a first pair of rail contacts and for applying a rail film breakdown potential from the other of said windings across said two rails at a second pair of rail contacts.

18. In combination with a stretch of railway track, a source of varying current, two transformers each energized from said source and each having an output winding, and means for applying a rail film breakdown potential from one of said output windings across the two rails of said track at a first pair of rail contacts and for applying a rail film breakdown potential across said two rails at a second pair of rail contacts.

19. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, and transformer means on said vehicle energized from said source and having two windings each of which is connected

across the two rails of the track by means of rail contacts, the instantaneous polarities of said contacts associated with either rail being opposite so that the voltages of said two windings will aid each other in breaking down the rail contact resistance to improve shunting of said track.

20. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, and two transformers on said vehicle each energized from said source and each having a winding which is connected across the two rails of the track by means of rail contacts the instantaneous polarities of said contacts associated with either rail being opposite so that the voltages of said two windings will aid each other in breaking down the rail contact resistance to improve shunting of said track.

21. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, transformer means on said vehicle energized from said source and having two output windings; and four connections, one from the positive terminal of one said winding to one rail of said track, a second from the negative terminal of said one winding to the other rail, a third from the positive terminal of the other said winding to said other rail, and a fourth from the negative terminal of said other winding to said one rail of the track, whereby rail contact resistance breakdown current will flow over a series circuit which includes said two windings and said four rail connections, and whereby two

paths will be effective for shunting the track, each path including one of said two windings and the two rail connections associated therewith.

22. In combination with a rail vehicle and a stretch of railway track, a source of varying current on said vehicle, two transformers on said vehicle each energized from said source and each having an output winding; and four connections, one from the positive terminal of one said winding to one rail of said track, a second from the negative terminal of said one winding to the other rail, a third from the positive terminal of the other said winding to said other rail, and a fourth from the negative terminal of said other winding to said one rail of the track, whereby rail contact resistance breakdown current will flow over a series circuit which includes said two windings and said four rail connections, and whereby two paths will be effective for shunting the track, each path including one of said two windings and the two rail connections associated therewith.

23. In combination with a rail vehicle and a stretch of railway track, a source of current on the vehicle, means for applying a rail film breakdown potential from said source across the two rails of said track to break down the rail contact resistance, and a reactor for limiting the amount of breakdown current flowing from said source when said contact resistance is broken down.

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