March 14, 1939. J. LEDWINKA 2,150,774

INDUCED SHUNTING

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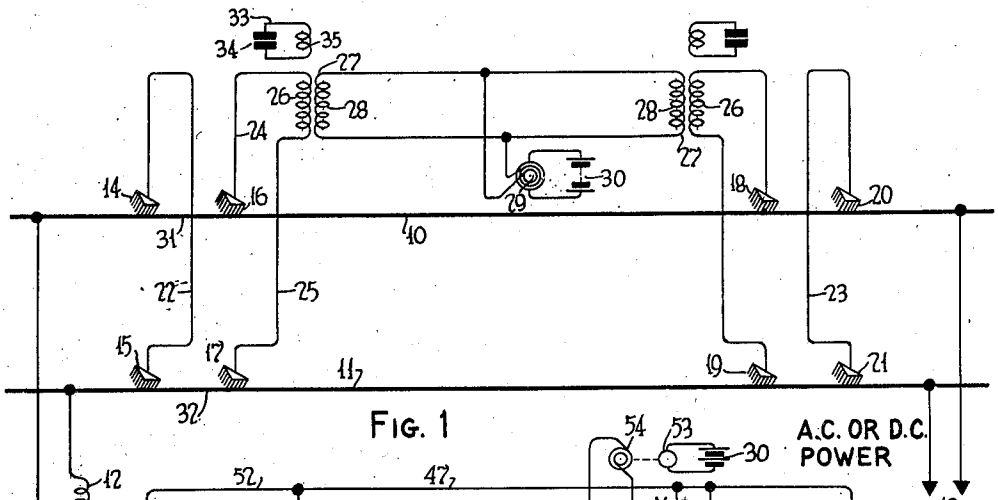


FIG. 1

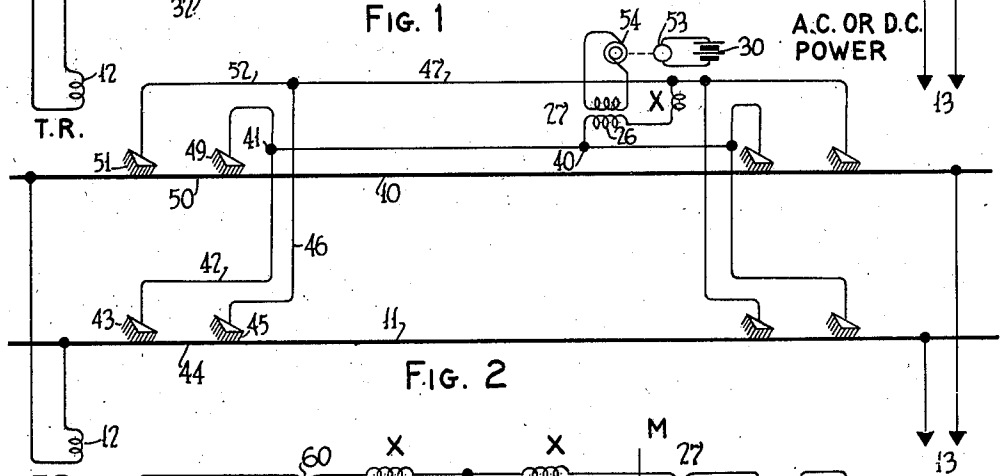


FIG. 2

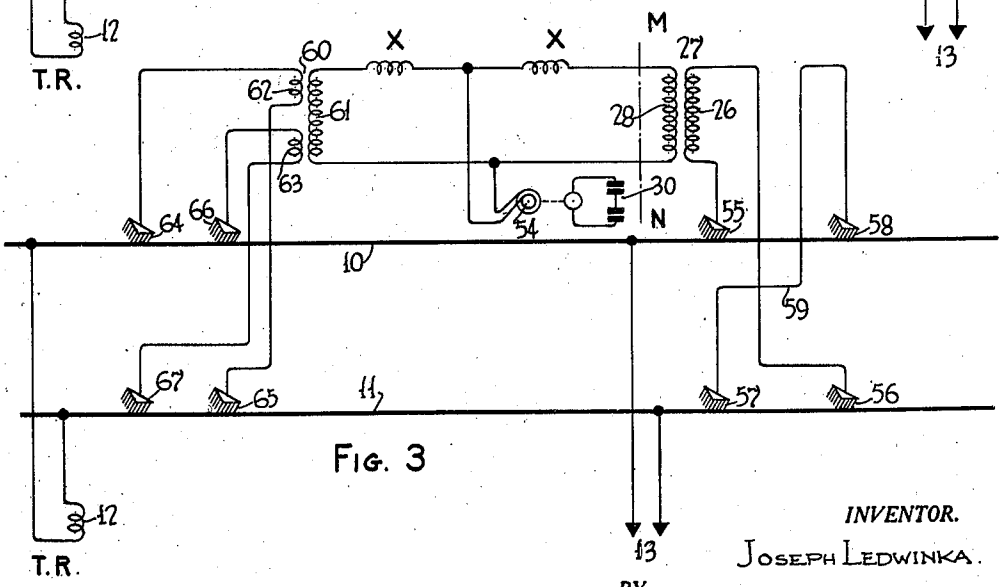


FIG. 3

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INDUCED SHUNTING

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2 Claims. (Cl. 246—34)

This invention relates to railway signalling and more particularly to a method and apparatus for shunting railway signalling track circuits by pneumatic tired rail vehicles or by single car trains.

Railway signalling operation has always been of vital importance and has never been absolutely certain in operation under all conditions of usage. To add to these difficulties single car trains, although possibly adequate in weight to provide contacts with the rails, when travelling at high speed over portions of trackage involving grade crossing signals, the vehicle passes between the sections of track energizing and de-energizing the signals so rapidly as to insubstantially operate the signals. Sometimes this operation may be entirely satisfactory, while again the operation may be entirely missing. To add to these difficulties the application of pneumatic tired rail vehicles has presented a still greater difficulty, consequently increasing the problems to be solved because the pneumatic tires effectively insulate the wheels and axles of the vehicle from the rails. Consequently, where with single car units having steel wheels, a shunt was provided, however inadequate it might be, with the pneumatic tired vehicle a shunt is entirely lacking.

To overcome these difficulties and others, applicant evolved a system and apparatus to insure adequate signal operation at all times.

The natural solution for overcoming these problems would have been to increase the weight per truck of the rail cars, but inasmuch as the ultimate goal was a minimum weight, or in other words, a maximum reduction in weight, this was directly contrary to the idea to be striven for. Other methods had to be used.

In railway signal operation it has been found that the basic resistance to track circuit shunting was located in a high resistance surface of the tracks, possibly a scale formation or oxide film. This had to be effectively diminished as a detriment to current passage, if effective signalling operation was to be obtained.

Applicant has accomplished this by what may be termed "induced shunting" wherein a plurality of conducting paths are placed between the track rails and a power means applied to these circuits in such a manner as to impress upon the track rails a potential sufficient to break down the oxide film and create a bridging current or carrier current to the rails, thus effectively reducing the shunt resistance and insuring adequate signal operation.

To adequately effect this desired operation applicant has so constructed the track engaging means such that the means itself will assist in destroying this oxide film. In this manner a current is set up along a conducting path between the rails, which current breaks down the surface resistance and creates a conducting path from one rail to the other, a current wave acting as a carrier or bridging current so that the track currents are provided with a plurality of shunts such as to maintain the shunt resistance sufficiently low so that the single mechanisms will properly operate.

This invention will be better understood from the following description when considered in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

Figure 1 illustrates a simple embodiment of this invention.

Figure 2 illustrates a slightly modified circuit arrangement, and

Figure 3 illustrates two additional circuit arrangements, one on the right hand and one on the left hand part of the figure.

Referring to the systems in more detail as shown in the drawing, the track rails 10 and 11 representing a single block and having track relays TR the coils 12 of which are associated with proper signalling mechanism. These tracks may be supplied with either alternating current or direct current power or any combination of the two from a source 13 not shown. Proper operation of the signalling device requires the interposition of adequate shunts between the rails 10 and 11 of each block during the passage of vehicles into, within, and out of the block.

To insure this shunting, contacting means are associated with the rails which may comprise shoes, contacts, brushes, or other members 14 carried upon the vehicle and contacting with the rails independently of the rail engaging surfaces of the individual wheels.

In Figure 1 these brushes comprise a series of groups 14 and 15, 16 and 17, 18 and 19, 20 and 21. Each brush is arranged to tilt about a pivot point so that it can assume a trailing position as regards the direction of motion of the vehicle, and each brush is connected by a low resistance current path with the remainder of its particular system.

The brushes 14 and 15 are connected by means of a low resistance path 22. Brushes 20 and 21 are likewise connected by a similar path 23, thus between the rails 10 and 11 are provided two parallel shunt paths. To increase the shunting

ability, two additional shunt paths are shown comprising the circuits made up by the brushes 16 and 17, the leads 24 and 25 and the secondaries 26 of transformers 27. The primary 28 of transformer 27 in this instance is supplied with energizing power by means of a rotary converter 29 which received power from a battery 30 carried on the vehicle.

To insure adequate operation under all conditions, a duplicate arrangement from that described with reference to one end of the vehicle is located with respect to the other end. The arrangement shown does not include switches, protective devices, current limiting reactors, etc. which are merely incidental to the system involving recognized good engineering practice.

The operation of the system is as follows: Alternating current generated by means of the rotary is applied to the secondary of the transformer, and being stepped up or down in accordance with the necessary potential and resistance of the track circuits etc. is applied to the rails by means of the brushes 16 and 17. The circuit path of this current may be considered for purposes of explanation, as to an instantaneous potential as being from the brush 16 through a portion 31 of the rail 10 to the brush 14 through lead 22 to brush 15 and thence through a portion of the track 32 to brush 17 and back to the transformer. This causes a complete circuit from the secondary of the transformer, providing two parallel shunt paths between the rails and a circuit path for the secondary of the transformer including portions 31 and 32 of the rails. By this system an alternating current is applied to the rails, which breaks down scale and provides conducting paths capable of shunting the track circuits.

To increase the assurance of adequate shunting while at the same time not affecting the signals to cause false operation, a high frequency current may be used as this carrier bridging current, the important feature being that the frequency is properly arranged to avoid false signal opeation. This may be obtained in one instance by the association of a circuit 33 having capacity and inductance 34 and 35 properly associated therein, the whole circuit being associated with the secondary of the energizing transformer to set up the necessary resonance frequency.

It is readily apparent that slight changes in the apparatus and system may be used for alternating current circuits, direct current circuits and combinations of the two, and that current limiting reactors cannot readily be placed in the proper portions of the circuit so that under best and most desirable shunting conditions dangerous currents will not flow through the apparatus.

It is also obvious that simple indicating mechanisms may be associated with the apparatus in such a manner as to indicate by bells, whistles, signal lights, etc. whether the circuits are satisfactorily operating and if not, calling the fact to the attention of the car operator so that proper steps will be taken to insure the safety of the vehicle and its passengers in accordance with the rules prescribed for protecting the trains.

The spaced relation of the brushes on the train, spaced in the direction of motion, is such as to insure crossing signal operation, etc. when passing cross-overs or sections of track where the insulating joints between signal circuits are displaced such that portions of two signal circuits are being shunted at the same time.

In Figure 2 a slightly different arrangement is shown, and in this instance a current limiting reactor X is interposed between the secondary 26 of the transformer 27 and the brush connecting circuits. In this instance the source of power of the transformer results from a motor generator set 53 and 54 driven by the car battery, the alternator of the set being connected to the transformer. Again, the description of the operation for one-half of the apparatus will be adequate, inasmuch as the apparatus is duplicated at each end of the vehicle.

For purposes of description considering instantaneous values and considering the connection 40 as the positive terminal of the transformer, current will flow from terminal 40 to terminal 41, thence through lead 42 to brush 43 through section of track 44, brush 45, lead 46, lead 47, back to the opposite terminal of the transformer and through the reactor. The current conducting path as far as the carrier current is concerned, passes through the two brushes on one side of the vehicle to the power source, and by means of the circuit of the brushes on the opposite side of the vehicle, creating the carrier which imposes the shunt upon the rails. The current flowing from the transformer through the other brushes goes from the terminal 40 to terminal 41, the brush 49, rail section 50, brush 51, lead 52, lead 47, back to the transformer. It is likewise obvious that a similar arrangement at the opposite end of the vehicle is similarly operable.

In Figure 3, two arrangements for adequately shunting the track circuit apparatus are disclosed; the first on the right hand end of the drawing to the right of the section line M—N discloses the secondary 26 of transformer 27 connected to brushes 55 and 56. In this instance the brushes 57 and 58 are connected together by means of a lead 59 similar to the arrangement in Figure 1, but the alternate front and rear brushes on opposite sides of the vehicle are connected together, providing a slightly different staggered relation arrangement. As to this equipment, the energizing means is the same as disclosed in Figure 2, namely, a motor generator set 53 and 54 driven from the vehicle battery system 30, but instead of using one current limiting reactor X, two are used.

The left hand portion of this figure shows an additional arrangement wherein a transformer 60 having a primary 61 and two secondary windings 62 and 63 are used, wherein secondary 62 is associated by suitable leads with brushes 64 and 65 and secondary 63 is associated with brushes 66 and 67. Each of these secondaries is arranged with very low resistance, thereby providing minimum resistance to current flow, and the secondary windings of the transformer as so related that any flow of direct circuit current through the windings will be such as to create interlying effects for any impedants.

As provided by the various circuit arrangements and diagrams illustrating this inventive concept fundamentally the operation of the track signal circuits is attained by creating shunt circuits between opposite rails of a railway track circuit, these circuits including portions of each rail and impressing upon these circuits a potential sufficient to break down the resistance of any oxide film or scale or any other resistance to current flow to insure an adequate series of shunts between the rails upon the vehicle independently of pneumatic tires when used. It is obvious that this invention is not limited to pneumatic tired

vehicles, but therein finds a most advantageous application.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the principle involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use, and all modifications within the true spirit and scope of the inventive concept are aimed to be covered by claims appended hereto.

What I claim is:

1. A shunting system for railway track circuits comprising, in combination with a rail vehicle, a first pair of contacts mounted on the vehicle and engaging one rail of said track, a second pair of contacts also mounted on the vehicle and engaging the other rail of said track, a first low impedance shunt conductor from one contact of said first pair to one contact of said second pair, a second low impedance shunt conductor from the other contact of said first pair to the other contact of said second pair, and a source of film breakdown voltage having one terminal connected to said first shunt conductor and having the other terminal connected to said other shunt conductor, whereby the rail film breakdown current from said source will normally divide in two parallel paths one of which includes the contacts of said first pair and the other of which includes the contacts of said second pair so that normally no appreciable potential will be impressed from said source across the two rails of said track.

2. A shunting system for railway track circuits comprising, in combination with a rail vehicle, a first pair of contacts mounted on the vehicle and engaging one rail of said track at separated points along the rail so as to include a section of rail between the contacts of said first pair, a second pair of contacts also mounted on the vehicle and engaging the other rail of said track at separated points along the rail so as to include a section of rail between the contacts of said second pair, a first low impedance shunt conductor from one contact of said first pair to one contact of said second pair, a second low impedance shunt conductor from the other contact of said first pair to the other contact of said second pair, and a source of film breakdown voltage having one terminal connected to said first shunt conductor and having the other terminal connected to said other shunt conductor, whereby the rail film breakdown current from said source will normally be confined to the rail sections included between the contacts of said first and said second pairs so that normally no appreciable potential will be impressed from said source across the two rails of said track.

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