March 24, 1942. H. R. HARSHMAN 2,277,099

BROKEN FLANGE DETECTOR FOR RAIL CARS

Filed July 10, 1940

FIG. 1.

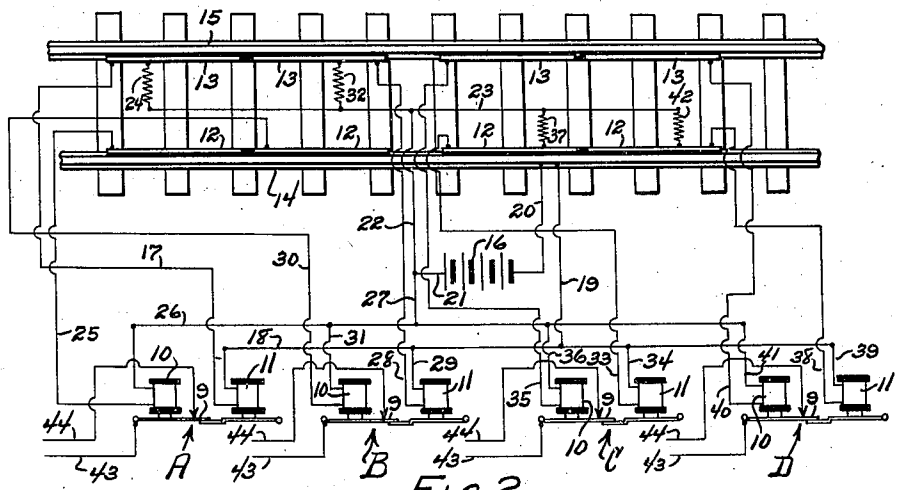


FIG. 2.

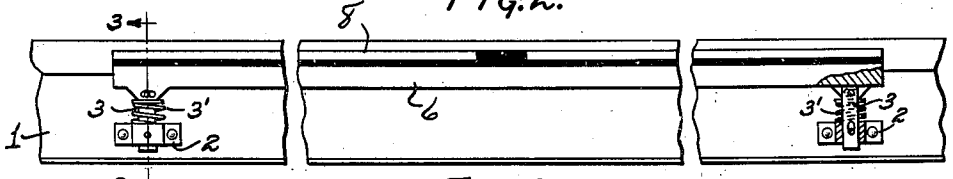


FIG. 5.

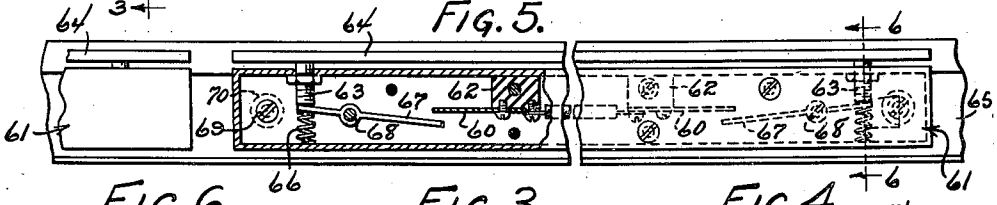


FIG. 6.

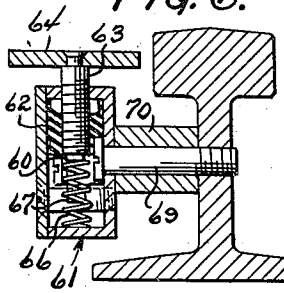


FIG. 3.

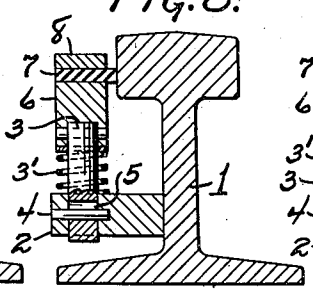
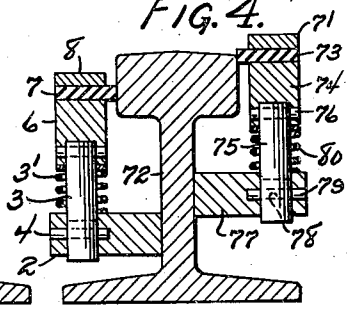


FIG. 4.



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BROKEN FLANGE DETECTOR FOR RAIL CARS

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2 Claims. (Cl. 246—169)

This invention relates to a broken flange detector for rail cars and has for an object to provide a system and apparatus including a locking relay, an alarm relay controlling an alarm circuit, and detector plates arranged for vertical movement on the inner sides of the rails to be depressed by unbroken flanges and to be unaffected by broken flanges to control the relays for energizing an alarm when a broken flange passes along the detector plates.

A further object is to provide a system and apparatus of this type in which the left wheel of the car truck operates a locking relay to detect broken flanges on the right wheel of the truck and vice versa, the system being divided into blocks or units so inter-connected that a broken flange will be positively detected before the wheels roll off of the last unit while the train is passing thereover.

A further object is to provide apparatus of this character which will be formed of a few strong, simple and durable parts, which will be inexpensive to manufacture, and which will not easily get out of order.

With the above and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawing forming a part of this specification:

Figure 1 is a plan view of a broken flange detector system and apparatus constructed in accordance with the invention, the electrical connections being shown diagrammatically.

Figure 2 is a side elevation of one of the track rails showing a pair of the detector plates secured to the inner side thereof for vertical movement.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a modified form of the detector plate to permit a broken tread to be detected.

Figure 5 is a modified form of the invention in which the detector plates are housed within a protective casing.

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 5.

Referring now to the drawing in which like characters of reference designate similar parts in the various views, 1 designates a track rail to the inner side of which is secured a bearing bracket 2 which slidably receives a vertically disposed pin 3 mounted for limited vertical movement by a guide pin 4 engaged through a slot 5 in the pin 3. A support plate 6 is fixed to the upper end of the pin 3 and superposed upon the plate is a block of insulation 7 upon which is disposed a metal detector plate 8 which is insulated from the rail by the insulating block 7. A helical spring 3' is sleeved upon the pin 3 and interposed between the support plate 6 and bracket 2 to normally hold the detector plate 8 just below the top of the rail head.

When a car wheel rolls along the rail 1 the flange will strike the detecting plate 8 and depress the same so that the wheel will form a bridging electrical conductor from the plate 8 to the rail 1.

For the purpose of clearness the detector plate 8 shown in Figures 2 and 3 has been designated 12 and 13 in Figure 1 to identify right and left detector plates.

There are four detector units A, B, C, and D, shown in the present embodiment of the invention, so that a broken flange will be detected before a wheel can roll from one end of the detecting device to the other end of the device. Each detector unit includes two relays 10 and 11, a right and left detector plate 12 and 13, respectively, the right and left track rails 14 and 15, and the battery 16. The relay 11 is a locking relay and the relay 10 is an alarm relay.

Unit A

The electrical connections of the unit A are as follows:

One end of the coil of the locking relay 11 is connected by a wire 17 to the left detector plate 13. The other end of the coil of the relay 11 is connected by a wire 18 to a wire 19 which is connected to the right rail 14. One side of the battery 16 is also connected to the rail 14 by a wire 20. The other side of the battery is connected by a wire 21 to a wire 22 which is connected to a wire 23 which is connected through a resistance coil 24 to the left detector plate 13. One end of the coil of the alarm relay 10 is connected by a wire 25 to the right detector plate 12. The other end of the coil of the relay 10 is connected by a wire 26 to a wire 27 which is connected to the wire 21 which leads from one side of the battery. The wire 26 is also connected to the wire 22 which is connected to the left detector plate 13.

Unit B

The electrical connections of the unit B are as follows:

One end of the coil of the locking relay 11 is connected by a wire 28 to the corresponding left detector plate 13. The other end of the coil of the relay 11 is connected by a wire 29 to the before-mentioned wire 18 which is connected to one side of the battery 16 by the wire 19, left rail 14 and wire 20. One end of the coil of the alarm relay 10 is connected by a wire 30 to the corresponding right detector plate 12. The

other end of the coil of the relay 10 is connected by a wire 31 to the wire 26 which, as previously described, is connected to the wire 27 which is connected to the other side of the battery by the wire 21 and is connected to the wires 22 and 23 which latter is connected through a respective resistance 32 to the corresponding left detector plate 13.

Unit C

The electrical connections of the unit C are as follows:

One end of the coil of the locking relay 11 is connected by a wire 33 to the corresponding right detector plate 12. The other end of the coil of the relay 11 is connected by a wire 34 to the before-mentioned wire 18 which is connected to one side of the battery 16 by the wire 19, left rail 14, and wire 20. One end of the coil of the alarm relay 10 is connected by a wire 35 to the corresponding left detector plate 13. The other end of the coil of the relay 10 is connected by a wire 36 to the wire 26 which, as previously described, is connected to the wire 27 which is connected to the other side of the battery by the wire 21 and is connected to the wires 22 and 23 which latter wire is connected by a respective resistance 37 to the corresponding right detector plate 12.

Unit D

The electrical connections of the unit D are as follows:

One end of the coil of the locking relay 11 is connected by a wire 38 to the corresponding right detector plate 12. The other end of the coil of the relay 11 is connected by a wire 39 to the before-mentioned wire 18 which is connected to one side of the battery 16 by the wire 19, left rail 14 and wire 20. One end of the coil of the alarm relay 10 is connected by a wire 40 to the corresponding left detector plate 13. The other end of the coil of the relay 10 is connected by a wire 41 to the wire 26 which, as previously described, is connected to the wire 27 which is connected to the other side of the battery by the wire 21 and is connected to the wires 22 and 23 which latter wire is connected by a respective resistance 42 to the corresponding right detector plate 12.

In operation the locking relays 11 are normally energized, for example, in the unit A a circuit may be traced from the negative side of the battery through the wire 21, wire 22, to common wire 23 through resistance 24 from detector plate 13, wire 17, one end of the coil of the relay 11 and from the other end of the coil of the relay through the wire 18, wire 19, right rail 14, and wire 20 to the positive side of the battery. This is a closed circuit and it will be shorted by a perfect left wheel flange cross connecting the detector plate 13 with the rail 15 since then the current will flow from the negative side of the battery through wire 21, wire 22, wire 23, resistance 24, detector plate 13, car wheel and axle to the right rail 14, and from the right rail through the wire 20 to the positive side of the battery, thus shorting out the coil of the relay 11 so that it will become de-energized and the armature thereof will drop. In the event the right wheel flange is broken and the relay 10 de-energized, as will be presently described, the armature of the relay 10 can drop and break the alarm circuit at a back contact 9 and extinguish the alarm device, such as a lamp, connected in the alarm circuit designed by the wires 43 and 44.

If the flange of the right wheel is not broken, however, the coil of the relay 10 will be energized as the wheel bridges the right rail 14 and right detector plate 12 to hold the alarm circuit closed and the lamp energized and this closed circuit may be traced from the negative side of the battery through the wire 21, wire 27, wire 26, coil of the relay 10, wire 25, detector plate 12, perfect wheel, rail 14, wire 20 to the positive side of the battery. In the event the right wheel flange is broken the circuit just traced is broken at the rail 14 and detector plate 12 since the broken flange will not reach the detector plate and the alarm device become extinguished. The utility of the four units, A, B, C, and D, for checking car wheels in mountain territory where the stress and strain to the flange of the wheels is more prevalent than at other points, is as follows:

When a car is in the zone of units A and B if a left wheel is broken and the opposite right wheel is perfect on encountering the detector plates 12 and 13, the circuit through the coil of the relay 11 does not become broken and the circuit of the coil 10 is closed between the detector plate 12 and good flange of the right wheel so that the signal circuit remains energized and the broken flange is not detected. As the train progresses, however, to the zone of units C and D the imperfect flange of the left wheel fails to close the circuit through the coil of the relay 10 and the perfect right wheel shorts the circuit of the coil 11 permitting the armatures of both relays 10 and 11 to drop and open the alarm circuit so that the broken flange will be detected in the zone of units C and D.

However, if the flange of the right wheel is broken as the car enters the zone of units A and B, assuming that the opposite left wheel is perfect, the circuit through the coil of the relay 11 is shorted as previously described and the circuit through the coil of the relay 10 is not closed since the wheel with the broken flange does not bridge the detector plate 12 and rail 14, thus permitting the armatures of both the relays 10 and 11 to drop and break the alarm circuit at the contact 9.

In localities where snow, sand and other debris may be expected it is desirable to shield the detector plates against the damage and to provide for this contingency the detector plates 60 are housed in a casing 61 instead of being exposed on the inside of the rails, and the detector plates are insulated from the casing by blocks of insulation 62. The detector plates are adapted to be placed in the circuit of the car wheels, however, by metallic plungers 63 which are connected by a metallic bar 64, best shown in Figure 6, disposed laterally of the head of the rail 65 on the inside of the rail. The bar 64 is yieldably held to be engaged by the flange through the medium of springs 66 disposed underneath the plungers. The low end of the plungers bear upon respective metal plates 67 which are pivoted intermediate their ends as shown at 68 in the casing and are adapted to contact with the detector plates 63 when the plungers are depressed. The casing is secured to the web of the rail by a bolt 69 and spacer 70.

To permit a broken tread of a car wheel to be detected as well as a broken flange for making a complete check of wheels entering or leaving terminals or yards, as best shown in Figure 4, a detector plate 71 is disposed upon the outer side of the rail 72 and is insulated from the rail by a block of insulation 73. The

block of insulation is carried by a bar 74 which is secured to a vertically movable pin 75 to a transverse pin 76. The bar is mounted for limited vertical movement in a supporting bracket 77 which is secured to the web of the rail. The pin is provided with a transverse slot 78 through which a stop pin 79 carried by the bracket is passed to limit vertical movement of the pin under the influence of a helical spring 80 which is sleeved on the pin between the bracket 77 and the bar 74.

In localities where snow, sand and other debris may be expected it is desirable to shield the detector plates against damage and to provide for this contingency the detector plates 60 are housed in a casing 61 instead of being exposed on the outside of the rails, and the detector plates are insulated from the casing by blocks of insulation 62. The detector plates are adapted to be placed on the outside of the rail and extending slightly above the lower face of the head of the rail 65, as best shown in Figure 6, as to construction, and best shown in Figure 4 as to elevation to rail 65 to permit a broken tread of a car wheel to be detected as well as a broken flange for making a complete check of wheels entering or leaving terminals or yards. The bar 64 is yieldably held to be engaged by the flange through the medium of springs 66 disposed underneath the plungers. The low end of the plungers bear upon respective metal plates 67 which are pivoted intermediate their ends as shown at 68 in the casing and are adapted to contact with the detector plates 63 when the plungers are depressed. The casing is secured to the web of the rail by a bolt 69 and spacer 70.

Since the operation of the parts has been described as a description of the parts progressed, it is thought the invention will be fully understood without further explanation.

What is claimed is:

1. A railway signal system for detecting broken wheel treads and flanges, comprising track rails, spring pressed detector plates spaced laterally from and slightly below the heads of respective rails, the rails and respective detector plates being bridged by car wheels having unbroken flanges to form circuit closers, a source of electricity, a locking relay, a normally closed car wheel controlled circuit including the coil of the relay, a conductor connecting one end of the coil to the detector plate of one rail, a conductor connecting the last named detector plate with one terminal of the source of electricity, a conductor connecting the other terminal of the source of electricity with the opposite rail, and a conductor connecting said opposite rail to the other end of the coil, said circuit being shorted through a car axle to the last named rail when a car wheel having an unbroken flange bridges the first named detector plate and the respective rail to deenergize the relay, an alarm circuit, an alarm device in the alarm circuit, an alarm relay having its armature in the alarm circuit, the armature of the locking relay normally engaging and holding the alarm relay armature in circuit closing position and releasing the alarm relay armature when the locking relay coil is shorted, and a normally open car wheel controlled circuit including the alarm relay coil, a conductor connecting one end of the coil with the first named terminal of the source of electricity and with the first named detector plate, and a conductor connecting the other end of the coil with the other detector plate, the last named circuit being closed when a wheel with an unbroken flange bridges the last named detector plate and respective rail to maintain the alarm relay armature in circuit closing position after the first named wheel controlled circuit has been shorted but being broken when a wheel with a broken flange fails to bridge the last named detector plate and respective rail and deenergizing the alarm relay to permit the armature thereof to move to open circuit position and deenergize the alarm device.

2. The structure as of claim 1 and in which said spring pressed detector plates each comprise, a casing disposed adjacent to one of the track rails, detector plates insulated from the casing and disposed within the casing, metallic plungers projecting from the casing, a bar connecting the plungers adapted to be disposed laterally of the head of a rail to be encountered by a car wheel, springs connected to the plungers adapted to move the plungers vertically, and pivoted metal plates having their outer ends engaged by the plungers and their inner ends adapted to contact with the detector plates when the plungers are depressed.

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