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FLAW DETECTOR MECHANISM

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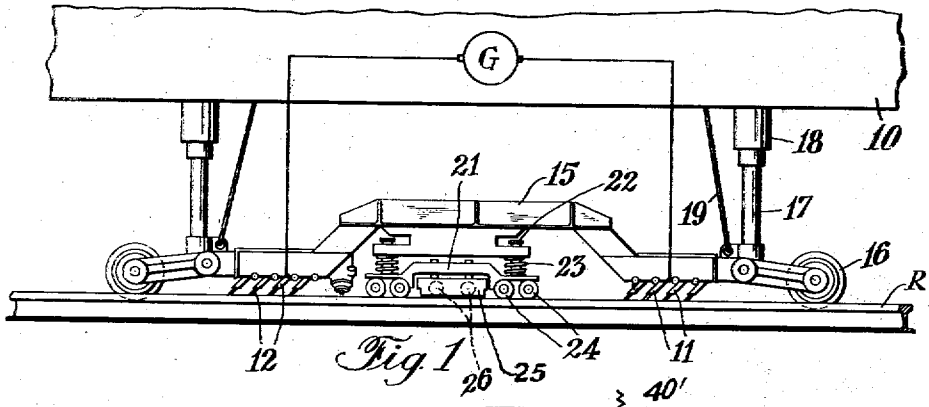



Fig. 1

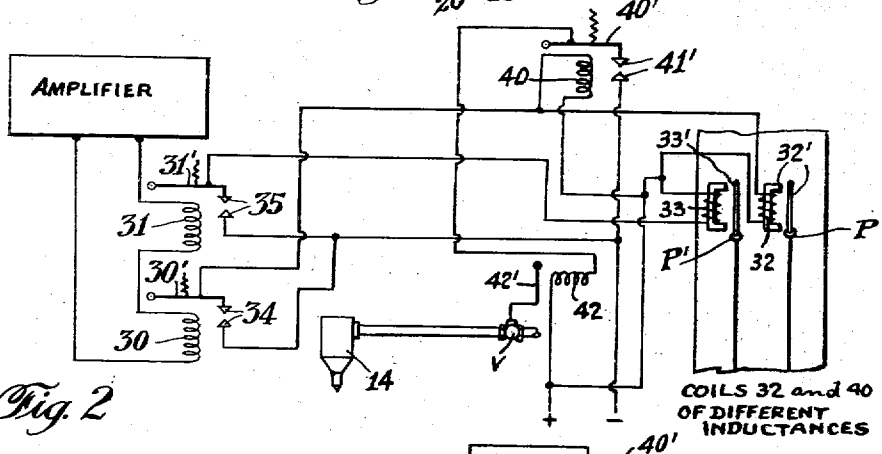



Fig. 2

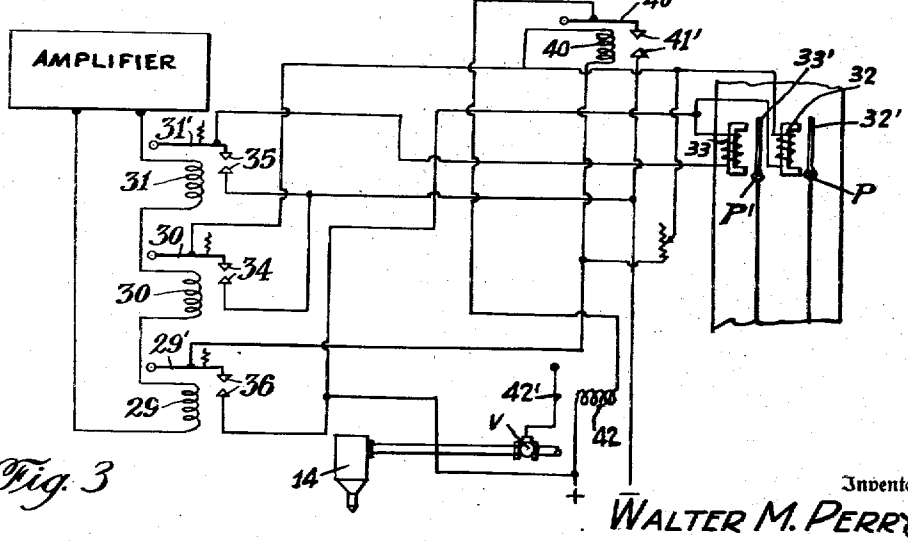



Fig. 3

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# UNITED STATES PATENT OFFICE

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## FLAW DETECTOR MECHANISM

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Application November 15, 1933, Serial No. 698,064

8 Claims. (Cl. 177—311)

This invention relates to rail flaw detector mechanism of the type employed in the Sperry rail flaw detector cars. The operation of such cars is now well known and consists in mechanism for locating and marking the region of flaws within the rail.

It has been found that on certain occasions the marking means, which in the Sperry detector car is usually paint squirted on to the rail from a paint gun, has been excessively actuated to give an unusually long paint mark which made it difficult to locate the flaw exactly and at the same time utilized an excessive amount of paint. It is the principal object of this invention to provide means whereby the actuation of the paint gun will be limited in extent.

Further objects and advantages of this invention will become apparent in the following detailed description thereof.

In the accompanying drawing,

Fig. 1 is a side elevation of a portion of a Sperry rail flaw detector car to which my invention is adapted to be applied.

Fig. 2 is a wiring diagram illustrating the condition which heretofore existed and which it is the object of my invention to remedy.

Fig. 3 is a wiring diagram similar to Fig. 2 but disclosing my invention applied thereto.

Referring to Fig. 1 of the drawing, there is disclosed a portion 10 of the car body of a Sperry rail flaw detector car. Within said car body is mounted a generator G which is designed to supply current through sets of brushes 11 or 12 adapted to engage the rail. Said sets of brushes are supported by a brush carriage 15 which is designed to travel along the rail R by means such as flanged wheels 16. The current brush carriage may be lowered into engagement with the rail by means such as pistons 17 operating in cylinders 18 to which fluid under pressure is adapted to be supplied when it is desired to lower the current brush carriage. When the fluid pressure supply to the cylinders 18 is cut off the current brush carriage will be raised by means of cables 19 and retracting springs (not shown). Mounted on the current brush carriage 15 is a detector carriage 21 which is designed to have movement independent of said current brush carriage by reason of a limited universal connection comprising loose-fitting bolts 22 and springs 23, the said detector carriage 21 being designed to travel along the rails by means such as rollers 24 engaging the rail surface. The flaw responsive means is supported from the detector carriage 21 within a sled or housing 25 and may comprise a pair of inductive coils 26 housed within said housing 25.

The operation of the Sperry car as thus described is well known. As the car travels along the rails current is supplied from the generator G to a portion of the rail between sets of brushes 11 and 12 to establish an electromagnetic field surrounding same. Said field will be uniform except in the region of flaw where it will be distorted. The coils 26 normally cut a constant number of lines of force and no E. M. F. is generated. On entering a region of flaw, however, one coil of the pair of coils 26 will cut a different number of lines of force to induce a differential E. M. F. which may be suitably amplified by amplifier A, the output of which may operate an indicator, such as pens on a moving chart. Variations in current supply from generator G will have no effect upon the coils 26 since they are of equal inductance and oppositely connected.

For operating the indicating means as well as making a mark upon the rail itself, I have shown the Sperry system heretofore employed and which consists in a plurality of relays 30 and 31 adapted to be energized by the output from the amplifier A. Said relays are responsive to currents of different magnitudes so that a weak output of amplifier A such as may be due to a slight flaw, will energize only relay 30 while a strong output will energize also relay 31. Each of these relays is caused to energize a pen relay 32, 33, designed to attract the armature 32', 33', respectively, said armature carrying pens P and P'. Said pens normally trace a straight line on the moving chart but when the pen relays 32, 33 are energized said pens are caused to make a jog in the line to indicate the presence of a flaw.

The circuit through relays 32 and 33 are controlled from relays 30 and 31 by attracting armatures 30' and 31' to close sets of contacts 34, 35. At the same time that contacts 34 close the circuit through the pen relay 32, they close the circuit through a paint gun relay 40 which attracts its armature 40' to close contacts 41' to close and thus complete a circuit through a relay 42 which attracts armature 42' to operate valve V controlling the discharge of paint through paint gun 14. The relay 40 is responsive only to currents of greater magnitude than those to which relays 32 and 33 respond.

It will be seen from Fig. 2 that the paint gun relay 40 and the pen relay 32 are connected in parallel so that when contacts 34 open the circuit through both relays should theoretically be broken. However, it has been found that these

two relays, as connected in Fig. 2, bear an inductive relation to each other, owing to their different characteristics, so that when contacts **34**, **35** are open, paint gun relay **40** continues to be actuated by reason of the induction between relays **32** and relay **40**.

In order to obviate the condition described above wherein the paint gun continues to be operated after contacts **34** have opened and, therefore, causes the paint gun to operate for an unnecessarily long period, I have provided the construction shown in Fig. 3. This consists in the addition of another relay **29** similar to relays **30** and **31** and similarly operated from the output of amplifier A. The relay **29** cooperates with armature **29'** to control contacts **36** positioned in the parallel circuit existing between relays **32** and **40** in Fig. **2**. The relay **29** responds to currents of lesser magnitude than either the relay **30** or **31**, so that it is sure to be energized whenever a flaw is passed over to attract its armature **29'** and close contacts **36**. It will now be seen that closing contacts **36** and contacts **34** will again energize the pen relay **32** and the paint gun relay **40**. However, when contacts **36** and **34** open, there is no inductive relation between relay **32** and relay **40** because the opening of contacts **36** opens the parallel circuit between relays **32** and **40** and breaks the inductive relation between them.

All of the relays attract their armatures against the action of retractile springs.

In accordance with the provisions of the patent statutes, I have herein described the principle and operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combination and relations described, some of these may be altered and others omitted without interfering with the more general results outlined, and the invention extends to such use.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a flaw detector mechanism for electrical conductors, a flaw-responsive means, an electrically operated marker, means whereby said marker is actuated by said responsive means for marking the conductor, an additional electrically operated indicator, means whereby said indicator is actuated by said responsive means, means rendered effective when said responsive means encounters a flaw for connecting said marker and said indicator in an inductive circuit, said marker and said indicator having different inductances, and means whereby said connection is broken when said responsive means passes beyond said flow.

2. In a flaw detector mechanism for electrical conductors, a flaw responsive means, an electrically operated marker, means whereby said marker is actuated by said responsive means for marking the conductor, an additional electrically operated indicator, means whereby said indicator is actuated by said responsive means, means rendered effective when said responsive means encounters a flaw for connecting said marker and said indicator in a parallel circuit, said marker and said indicator having different inductances and means whereby said connection is broken when said responsive means passes beyond said flaw.

3. In a flaw detector mechanism for electrical conductors, a flaw responsive means, an electrically operated marker for marking the conductor, an additional electrically operated indicator, means including a relay in the marker circuit and a relay in the indicator circuit whereby said responsive means actuates said marker and said indicator, means rendered effective when said responsive means encounters a flaw for connecting said relays in an inductive circuit, said relays having different inductances, and means whereby said connection is broken when said responsive means passes beyond said flaw.

4. In a flaw detector mechanism for electrical conductors, a flaw responsive means, an electrically operated marker for marking the conductor, an additional electrically operated indicator, means including a relay in the marker circuit and a relay in the indicator circuit whereby said responsive means actuates said marker and said indicator, means rendered effective when said responsive means encounters a flaw for connecting said relays in a parallel circuit, said relays having different inductances, and means whereby said connection is broken when said responsive means passes beyond said flaw.

5. In a flaw detector mechanism for electrical conductors, a flaw responsive means, an electrically operated marker, means whereby said marker is actuated by said responsive means for marking the conductor, an additional electrically operated indicator, means whereby said indicator is actuated by said responsive means, a relay, means whereby said relay is rendered effective when said responsive means encounters a flaw and is rendered ineffective when said responsive means passes beyond the flaw, means including a set of contacts, means whereby said set of contacts is actuated by said relay when rendered effective for connecting said indicator and said marker in an inductive circuit, said marker and said indicator having different inductances and means for actuating said contacts to break said inductive circuit when said relay is rendered ineffective.

6. In a flaw detector mechanism for electrical conductors, a flaw responsive means, an electrically operated marker, means whereby said marker is actuated by said responsive means for marking the conductor, an additional electrically operated indicator, means whereby said indicator is actuated by said responsive means, a relay, means whereby said relay is rendered effective when said responsive means encounters a flaw and is rendered ineffective when said responsive means passes beyond the flaw, means including a set of contacts, means whereby said set of contacts is actuated by said relay when rendered effective for connecting said indicator and said marker in a parallel circuit, said marker and said indicator having different inductances and means for actuating said contacts to break said circuit when said relay is rendered ineffective.

7. In a flaw detector mechanism for electrical conductors, a flaw responsive mechanism, an electrically operated marker for marking the conductor, an additional electrically operated indicator and means whereby said flaw responsive means actuates said marker and said indicator, said last-named means comprising a plu-

rality of relays responsive to currents of various magnitudes adapted to be energized by said flaw responsive means, a main circuit through said marker and said indicator including the relay responsive only to currents of relatively greater magnitude, an inductive circuit through said marker and said indicator controlled by the relay responsive to currents of relatively lesser magnitude; said marker and said indicator having different inductances and means for maintaining said inductive circuit open when said last named relay is de-energized.

8. In a flaw detector mechanism for electrical conductors, a flaw responsive mechanism, an electrically operated marker for marking the conductor, an additional electrically operated indicator and means whereby said flaw responsive means actuates said marker and said indicator, said last-named means comprising a plurality of relays responsive to currents of various magnitudes adapted to be energized by said flaw responsive means, a main circuit through said marker and said indicator including the relay responsive only to currents of relatively greater magnitude, a parallel circuit through said marker and said indicator controlled by the relay responsive to currents of relatively lesser magnitude; said marker and said indicator having different inductances and means for maintaining said parallel circuit open when said last named relay is de-energized.

WALTER M. PERRY.

## CERTIFICATE OF CORRECTION.

Patent No. 2,061,979. November 24, 1936.

WALTER M. PERRY.

It is hereby certified that error appears in the printed specifiation of the above numbered patent requiring correction as follows: Page 2, first column, line 63, claim 1, for the word "flow" read flaw; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of February, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.

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8. In a flaw detector mechanism for electrical conductors, a flaw responsive mechanism, an electrically operated marker for marking the conductor, an additional electrically operated indicator and means whereby said flaw responsive means actuates said marker and said indicator, said last-named means comprising a plurality of relays responsive to currents of various magnitudes adapted to be energized by said flaw responsive means, a main circuit through said marker and said indicator including the relay responsive only to currents of relatively greater magnitude, a parallel circuit through said marker and said indicator controlled by the relay responsive to currents of relatively lesser magnitude; said marker and said indicator having different inductances and means for maintaining said parallel circuit open when said last named relay is de-energized.

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