

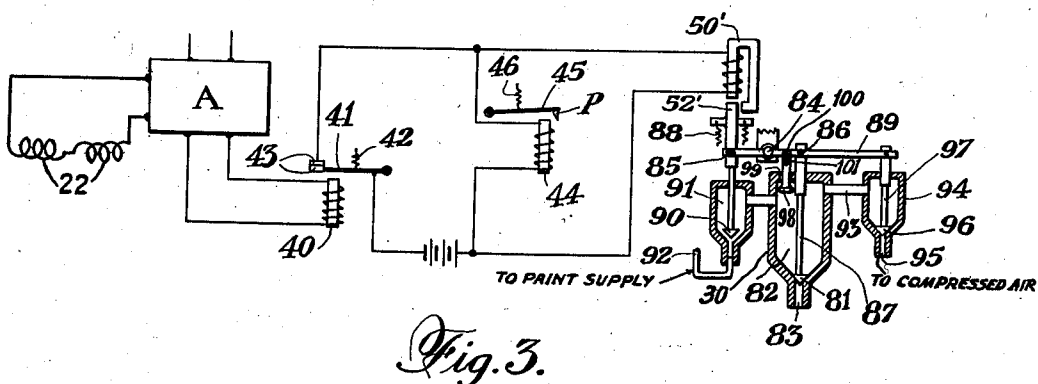
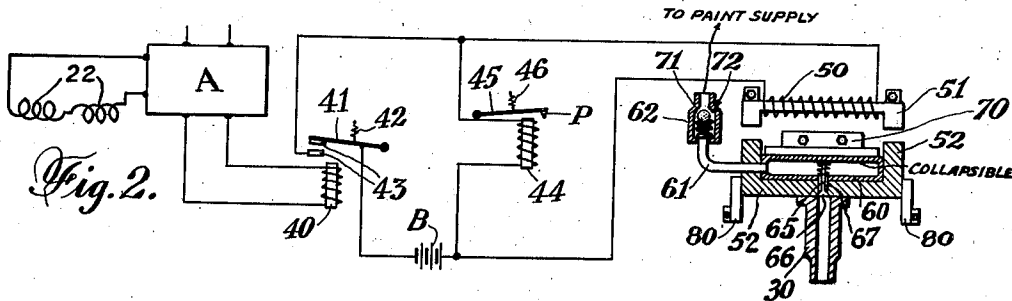
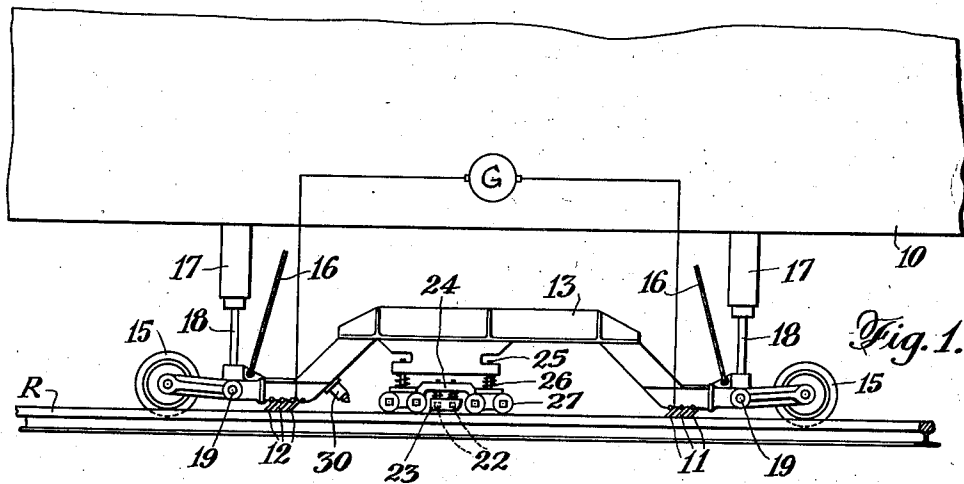
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RAIL FLAW DETECTOR MECHANISM

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RAIL FLAW DETECTOR MECHANISM

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This invention relates to rail flaw detector mechanisms of the type embodied in the Sperry rail flaw detector. The operation of these mechanisms is now well known and consists of a car which operates along the rails and carries a mechanism responsive to internal flaws. When such a flaw is encountered an indication is made upon a chart in the moving car and at the same time marking means such as paint is discharged on the rail in the region of flaw.

It is highly desirable that the marking means should operate quickly in response to energization in order that the mark on the rail may be properly located, and it is further desirable that the mark be limited in extent to substantially the region of a flaw. If the marking means is slow in responding to an impulse it may be that the paint will be placed upon the rail at a point several inches removed from an actual flaw and may be located at a surface defect such as a burn which the operator will misinterpret. Also, if the mark is too long it may be that the said mark originally was made in response to a surface defect but extends along the rail to such a distance that a fissure near a surface defect will be missed since the operator will interpret the mark, no matter how long, as being due to the surface defect.

This invention, therefore, has for its principal object the provision of rail marking means and actuating means therefor which will result in a quick response of the marking means and which will yield a mark of relatively short length.

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 view of a Sperry rail fissure detector car, the main portion of the car being broken away to show the detector mechanism.

Fig. 2 is a view largely in the form of a wiring diagram illustrating one form of our invention.

Fig. 3 is a view similar to Fig. 2 illustrating another form of the invention.

Referring to Fig. 1 of the drawing, there are shown the parts of a standard Sperry rail fissure detector car which includes a car body 10 operating along the rails R. Fissure detection is accomplished by passing current through each rail from a generator G within the car-body supplying current to spaced current brushes 11 and 12 supported upon the current brush carriage 13 which when in lowered or effective position is adapted to ride upon the rail by means such as wheels 15. The current brush carriage 13 is normally held in elevated or ineffective position

by means of springs, not shown, and cables 16, but when it is desired to lower said carriage, fluid pressure such as compressed air is supplied to the cylinders 17 to force out pistons 18 which are pivotally connected at 19 to the current brush carriage 13. The current passed through the rail by way of spaced brushes 11 and 12 will establish an electromagnetic field surrounding the rail and this field will be uniform except in the region of flaw, where it will be distorted. Such distortions of the electromagnetic field are detected by a flaw responsive mechanism which may take the form of a pair of opposed induction coils 22 supported in a housing 23 at a constant distance above the rail surface by means of a carriage 24. Said carriage 24 is mounted on current brush carriage 13 by means of loosely fitting bolts 25 and springs 26 to permit said carriage 24, while riding on the rail on means such as wheels 27, to move independently of carriage 13 so that the said carriage 24 may at all times maintain parallelism with the rail surface regardless of irregularities thereof. The coils 22 normally cut the same number of lines of force, but on entering a region of flaw, first one coil and then the other will cut a different number of lines of force to generate a differential E. M. F. which after being suitably amplified by an amplifier A may be caused to actuate a pen P operating on a chart, not shown. At the same time that pen P is actuated, there is actuated also marking means which may take the form of a paint gun 30 mounted on the current brush carriage 13 a sufficient distance behind the flaw responsive members 22 to compensate for the movement of the car and for the lag in operation of the paint gun.

As stated in the introduction hereto, it is highly desirable that the paint gun be so operated that a relatively short mark will be placed upon the rail in the region of flaw, regardless of the magnitude of the impulse passing through the amplifier A or the length of time that said impulse persists. For this purpose we have provided various forms of our invention, one of which is disclosed in Fig. 2. In this form of the invention the impulse from amplifier A energizes magnet 40 which attracts its armature 41 against the action of spring 42 to close a set of contacts 43 and close a circuit including a source of energy such as battery B to energize a magnet 44 which attracts an armature 45 against the action of a spring 46 to actuate the pen P on the chart, not shown. The pen P normally draws a straight line on the chart which is moving continuously, but when actuated by the magnet 44 it makes a 55

notch in the straight line, indicating the presence of a flaw in the rail.

At the same time that magnet 44 is energized by the closing of contacts 43 there is also energized a magnet 50 surrounding a fixed core 51. Said magnet when energized is adapted to attract its armature 52 which may take the form of a U-shaped member in the base of which is provided a resilient container 60 having communication by means of pipe 61 and a one-way valve 62 with a source of paint supply, not shown. The valve 62 comprises a ball 71 fixed to the upper end of the coil spring 72 seated within valve chamber 62 and normally holding ball 71 off the valve seat 73. When said resilient container 60 is compressed, a valve stem 65 carried thereby is adapted to be moved through the U-shaped member 52 to unseat a valve 66 carried by stem 65 and thus open a passage 67. A fixed plate 70 is provided immediately above the container 60.

The operation of the above device will now become apparent. When an impulse from amplifier A closes contacts 43 to energize pen magnet coil 44 and magnet 50, the armature 52 is attracted by the magnet 50 and thus causes the container 60 to be discharged through discharge passage 67. The paint cannot be discharged back into the supply system because the pressure within container 60 causes the ball 71 of the one-way valve 62 to be seated against paint inlet valve seat 72 and shut off the supply of paint while container 60 is being discharged. The dimensions of container 60 are such that the movement of armature 52 in response to the attraction of magnet 50 will be such as to discharge said container completely and the dimensions of said container are such that a complete discharge thereof will yield a paint mark of the desired size, which in rail flaw practice has been found to be a mark of about three inches in diameter. No matter how long the magnet 50 is energized nor how great the impulse passing therethrough, the mark on the rail will always be of constant size because the container 60 is completely discharged at each actuation of armature 52 and the quantity of paint held by said container is constant. The characteristics of the various parts are such that any impulse from amplifier A which is sufficient to cause actuation of pen P will cause magnet 51 to attract armature 52 to a degree such that container 60 is completely discharged. When the magnet 50 is de-energized, armature 52 drops and the suction thus created within resilient container 60 causes valve 71 to be unseated against the action of spring 73 to permit paint from the supply to be drawn in and fill container 60 which is then ready for the next actuation. If desired, in addition to the resiliency of the container 60 itself, a spring may be wound around stem 65 within the container to increase the speed of return of the container to initial position. Guide members 80 may be provided for guiding the movement of armature 52.

In Fig. 3 we have shown another form of our invention. In this form the impulse from amplifier A again energizes magnet 40, but it has been found desirable to cause said magnet when energized to break contacts 43 against the action of spring 42. This means that pen magnet 44 is normally energized to attract its armature 45 against the action of spring 46. Also, magnet 50' is continuously energized to attract its armature 52' and thus maintain closed the valve 81 controlling the discharge of paint from container

82 through outlet 83. This is accomplished by means of a lever pivoted at 84 and having one end connected to armature 52' at 85 and being connected on the other side of its fulcrum at 86 to the valve stem 87 of the paint gun. Therefore, since coil 50' is normally energized to attract armature 52', valve stem 87 will be normally depressed to maintain valve 81 closed. When, however, an impulse passes through amplifier A to energize coil 40, contacts 43 are broken, pen magnet 44 is de-energized to permit pen P to be moved by spring 46 to form a notch in the straight line, magnet 50' is de-energized to permit springs 88 to withdraw armature 52' and thus lift valve stem 87 and valve 81 so that the paint may be discharged through outlet 83.

In order that the amount of paint discharged each time valve 81 is operated may be constant, we have provided the following mechanism: Armature 52' carries at its lower end a valve 90 in a chamber 91 which connects by means of pipe 92 with the source of paint supply. When valve 81 is closed, valve 90 being on the other side of pivot 84 is opened, and when valve 81 opens to discharge, the paint valve 90 closes. Since valve 90 closes when valve 81 opens, the amount of paint that can be discharged is constant and is equal to the amount of paint within the measuring chamber 82. In order that this discharge shall take place with sufficient speed to empty the chamber every time coil 50' is de-energized, we have connected the upper end of chamber 82 with a source of compressed fluid supply, preferably compressed air. This connection is made by way of pipe 93 connecting chamber 82 with a valve chamber 94 which has an outlet 95 connected to a source of compressed air supply. Said source of compressed air is normally cut off from chamber 82, while valve 81 is seated, by means of a valve 96 which is normally held seated at the same time that valve 81 is seated by reason of the fact that its valve stem 97 is connected to the same side of the fulcrum of the lever as the valve stem 87. Thus, when armature 52' drops by reason of the de-energization of coil 50', both valves 81 and 96 are opened simultaneously so that compressed air blows into the chamber 82 and quickly discharges the paint supply held therein; and since the source of paint supply is closed by reason of valve 90 being seated at the time, a constant amount of paint will be ejected at each actuation of the valve 81.

To permit the paint to flow into chamber 82 when valve 81 is seated and valve 90 opened, a float valve 98 is provided in the upper end of chamber 82 and is connected by pin and slot connection 100, 101 on the same side of the pivot of lever 89 as valve stem 87. Hence, when valve 81 is seated, valve 98 is opened to permit access to the atmosphere through outlet 99 so that paint may enter from chamber 91 into chamber 82, displacing the air through outlet 99, until chamber 82 fills and lifts valve 98 to close the same. When, however, valves 81 and 96 are lifted, valve 98 is seated to close the outlet passage 99 so that neither the compressed air nor paint can be blown through said outlet.

In accordance with the provisions of the patent statutes, we have herein described the principle and operation of our invention, together with the apparatus which we now consider to represent the best embodiment thereof, but we desire to have it understood that the apparatus shown is only illustrative and that the invention can be

carried out by other equivalent 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 our invention, what we claim and desire to secure by Letters Patent is:

1. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, means for separating from said supply a measured quantity of said fluid, and means controlled by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, for discharging said measured quantity of fluid in the region of flaw.

2. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, a container normally connected to said supply and adapted to contain a measured quantity of said fluid, and means controlled by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, for disconnecting said container from said supply and discharging said measured quantity of fluid in the region of flaw.

3. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, means for separating from said supply a measured quantity of said fluid, a supply of fluid under pressure, and means controlled by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, for connecting said fluid under pressure to said separating means and discharging said measured quantity of marking fluid.

4. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, a container normally connected to said supply and adapted to contain a measured quantity of said fluid, a supply of fluid under pressure normally disconnected from said container, and means controlled by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, for disconnecting said container from said marking fluid supply, connecting said container to said fluid pressure supply and discharging said measured quantity of marking fluid in the region of flaw.

5. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, a container normally connected to said supply and adapted to

contain a measured quantity of said fluid, said container normally being connected with the atmosphere, a supply of fluid under pressure normally disconnected from said container, and means controlled by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, for disconnecting said container from said supply of marking fluid, closing said connection of the container with the atmosphere, connecting said container to said fluid pressure supply and discharging said measured quantity of marking fluid in the region of flaw.

6. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, a collapsible container normally connected to said supply and adapted to contain a measured quantity of said fluid, and means controlled by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, for disconnecting said container from said supply and collapsing said container to discharge said measured quantity of fluid in the region of flaw.

7. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, a resilient collapsible container normally connected to said supply and adapted to contain a measured quantity of said fluid, means rendered effective by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, when said responsive means encounters a region of flaw, for collapsing said container to discharge said measured quantity of fluid in the region of flaw, and means controlled by the movements of said container to collapsed and expanded positions for disconnecting and connecting said container to said supply.

8. In a rail flaw detector mechanism, means responsive to flaw, the degree of energization of said responsive means varying with different flaws, a supply of marking fluid, a collapsible container normally connected to said supply and adapted to contain a measured quantity of said fluid, said container having resilient means tending to maintain it in expanded position, means rendered effective by energization from said responsive means in excess of a predetermined degree, irrespective of the amount of excess, when said responsive means encounters a region of flaw, for collapsing said container against the action of said resilient means to discharge said measured quantity of fluid in the region of flaw, and means controlled by the movements of said container to collapsed and expanded positions for disconnecting and connecting said container to said supply.

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