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METHOD AND MEANS FOR DETECTING FLAWS IN RAILS

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FIG. 1

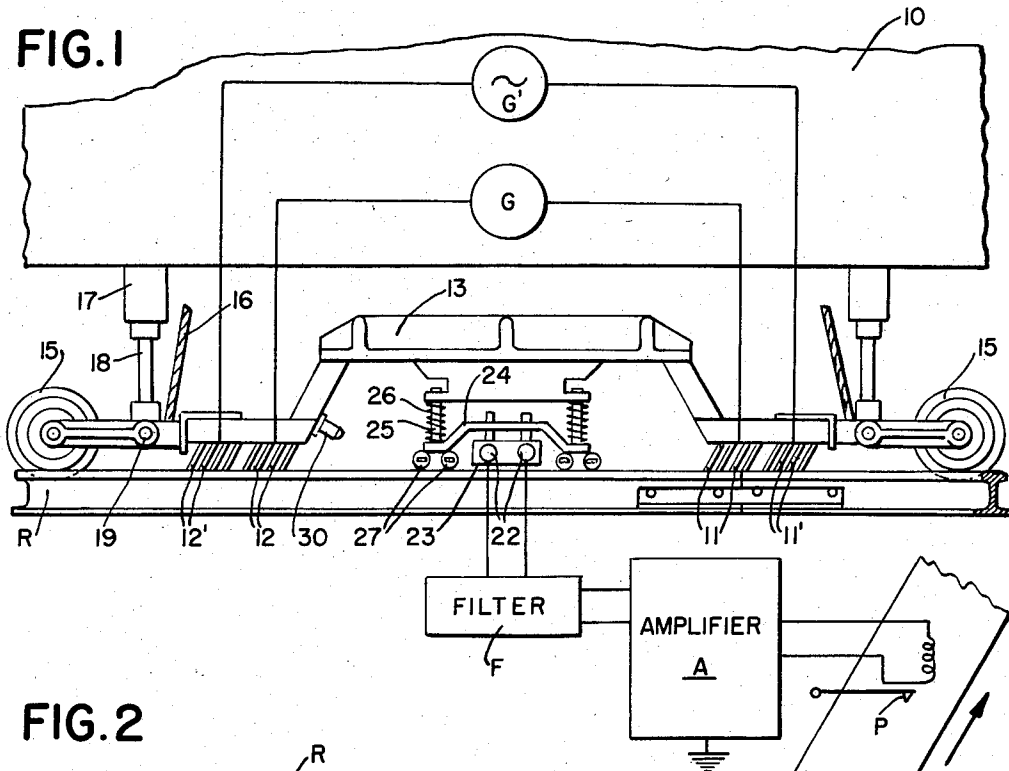
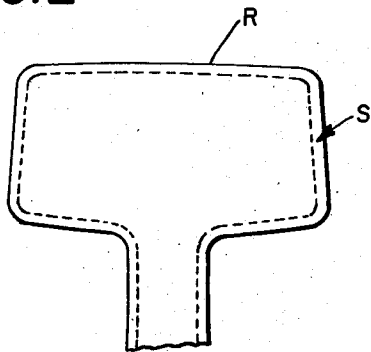


FIG. 2



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METHOD AND MEANS FOR DETECTING FLAWS IN RAILS

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2 Claims. (Cl. 324—37)

This invention relates to rail fissure detector means and more particularly to the type of detector mechanism employed on the Sperry rail flaw detector car. This car operates upon the principle of energizing the rail with flux, as, for instance, by passing direct current through the rail to establish an electromagnetic field surrounding the same and exploring said field by inductive means to discover any irregularities caused by the presence of internal fissures or other discontinuities in the rail. Such irregularities will cause the inductive means to generate an E.M.F. which after being suitably amplified may be caused to operate an indicator, such as a recorder, within the car and a paint gun for marking with paint the region of flaw within the rail.

The particular problem which presents itself here arises from the fact that variations in the electromagnetic field surrounding the rail are set up not only by internal fissures which it is the function of the mechanism to detect, but also by surface irregularities, such as wheel burns, shelly spots and the like, which are not detrimental to the use of the rail and which it is not the object of the car to detect. The operator within the car seeing the indication upon the recording tape must, therefore, use his own judgment derived from viewing the rail from the car to determine whether the mark has been caused by a surface defect or by an internal fissure. Frequently this results in many unnecessary stops of the car for the purpose of hand testing the region where indications are made.

It is, therefore, the principal object of this invention to provide a method and means which may be employed on detector cars of the Sperry type which will substantially eliminate the recording of surface defects so that only true internal defects will be apparent to the operator.

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

In the accompanying drawings,

Fig. 1 is a side elevation of a portion of a rail fissure detector car having my invention applied thereto.

Fig. 2 is a section through a portion of rail and showing diagrammatically the theory underlying this invention.

Referring to Fig. 1 of the drawings, 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 indication is accomplished by energizing the rail with flux by passing high amperage, low voltage direct 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 rails 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 cable 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

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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 C. At the same time that the pen 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 flux responsive member 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, the inductive means, i.e. coils 22, will pick up variations in the electromagnetic field caused not only by the presence of internal fissures which deflect the path of the current and therefore vary the electromagnetic field surrounding the rail, but said coils will also pick up variations in the field caused by surface irregularities, such as wheel burns, shelly spots and the like. I have found that the chief reason for the change in the electromagnetic field by surface irregularities resides in the fact that these surface defects invariably are accompanied by the presence of slivers of material which have become more or less detached from the clear surface of the rail. When the heavy direct current is passed through the rail, these slivers become highly active magnets which arrange themselves in the electromagnetic field and will, therefore, vary the flux pattern in said field, which variation is then detected by the induction coils and results in the generation of a differential E.M.F. and the actuation of the indicating means both inside and outside of the car.

I have, therefore, devised the following method and means for overcoming the effects of such surface condition. For this purpose, I pass through the rail, simultaneously with the direct current, an alternating current of relatively high frequency so that the skin effect will confine the alternating current to the surface as at S (Fig. 2). The rapid change in polarity of the alternating current will neutralize the magnetism of the slivers so that they will no longer introduce a variation in the electromagnetic field surrounding the rail. For this purpose there may be employed a second generator G' adapted to generate alternating current of the required frequency, for example, 400 cycles, and this current is introduced simultaneously with the direct current in substantially the same section of the rail by means of a second set of brushes 11' and 12'.

There now remains merely the problem of filtering out the variations in the electromagnetic field caused by the alternating current, but this is easily done by the interposition of a filter F designed to filter out the relative high frequency alternating current while allowing the lower frequency variations in the electromagnetic field to pass through to the amplifier and the indicators.

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

1. A rail flaw detector mechanism comprising means

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for passing direct current between spaced points along the rail to establish an electromagnetic field surrounding the same, means for simultaneously passing alternating current between said points, means for detecting variations in said electromagnetic field, means for filtering out from the detected variations those variations due to the alternating current, and indicating the remaining variations in the electromagnetic field. 5

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2. A rail flaw detector mechanism as specified in claim 1, in which the alternating current has a frequency sufficiently high to cause the current to lie substantially close to the surface.

No references cited.