

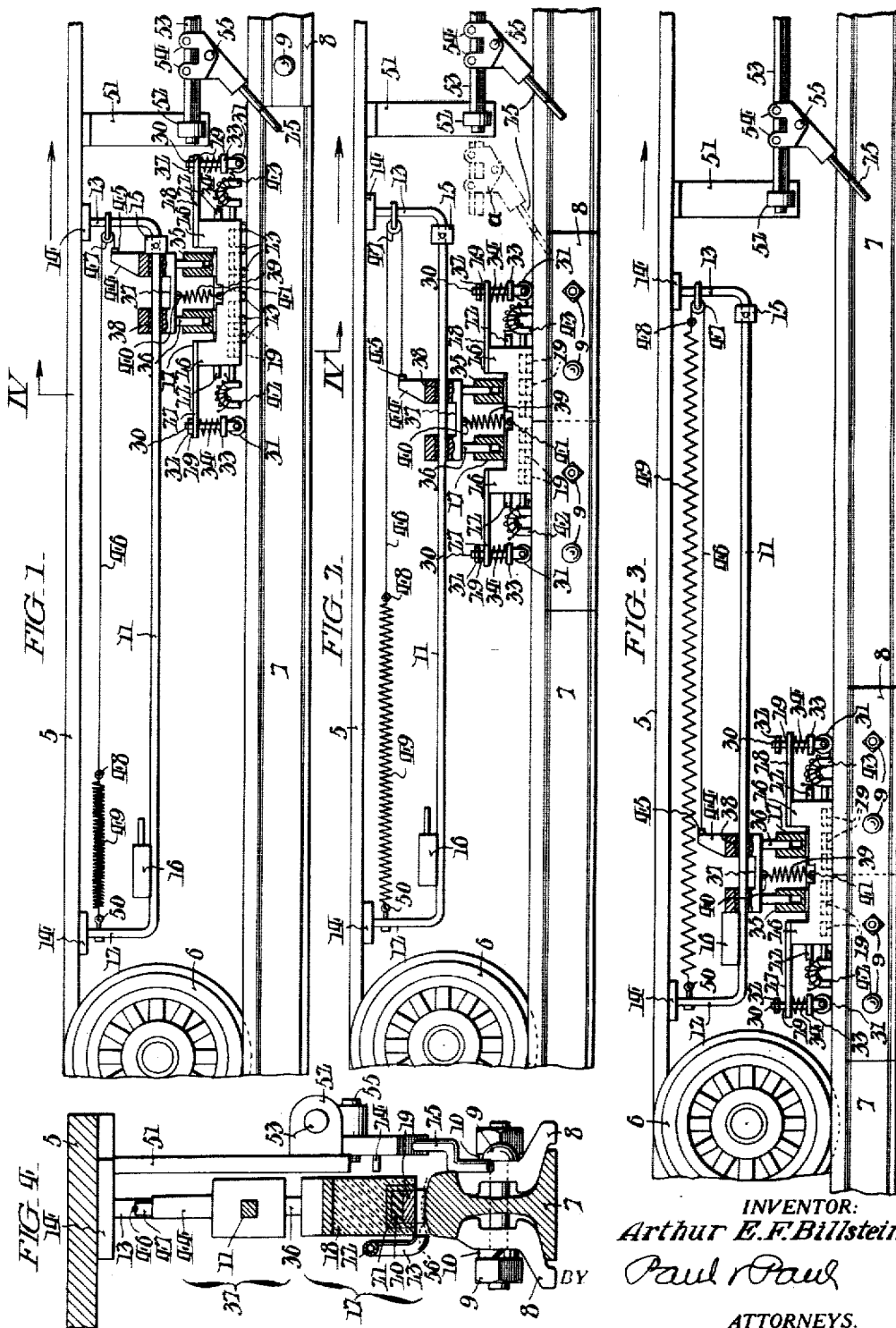
July 21, 1953

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2,645,938

RAIL FLAW-DETECTING DEVICE

Filed Nov. 16, 1948



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UNITED STATES PATENT OFFICE

2,645,938

RAIL FLAW-DETECTING DEVICE

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Application November 16, 1948, Serial No. 60,198

17 Claims. (Cl. 73-146)

1 This invention has general reference to means for locating imperfections in metallic bars and relates more particularly to devices for detecting flaws in railroad track rails and especially such flaws as may exist within the region of the joint bar bolt holes.

The primary object of my present invention is to provide a portable flaw-detecting device in which the detecting means is held stationary with respect to that portion of the rail being tested, while the carrier therefor moves along said rail during the actual testing interval.

Another object of my invention is to provide a flaw-detecting device which is easily mounted on a suitable vehicle for coupling to a motorized car, and which is well adapted for testing track rails within the joint bar region only.

A further object of my invention is to provide a flaw-detecting device of the type above referred to in which a supersonic detector means is pendently mounted from the vehicle with capacity for the latter to travel within determined limits, while said detector means is held to the rail joint being tested.

Other objects and attendant advantages of my invention will become apparent from the following detailed description of the typical embodiment thereof shown by the accompanying sheet of drawings wherein like reference characters designate corresponding parts in all the views; while the claims more particularly define the features of novelty over the prior art.

Fig. 1 is a part elevation and part sectional view of one practical form of flaw-detecting device, as attached to a suitable vehicle for use on railroad tracks, and with the flaw-detecting means in its inactive position.

Fig. 2 is a similar view to the preceding figure but with the flaw-detecting means in operative position.

Fig. 3 is a view like Fig. 2 showing the flaw-detecting means engaged with a movement limiting switch and said means ready for release from contact with the rail for return to the position of Fig. 1.

Fig. 4 is a vertical section taken approximately as indicated by the arrows IV-IV in Fig. 1, with parts in section and drawn to relatively larger scale for clearer illustration of important details.

In describing the embodiment of my invention exemplified by the accompanying drawings herewith, specific terms will be employed for the sake of clarity, but it is to be understood the scope of said invention is not thereby limited; each such

2 term being intended to embrace all equivalents which perform the same function for an analogous purpose.

Referring more in detail to the drawings, the numeral 5 designates the deck of a light vehicle equipped with wheels 6, one only being shown, adapted for traveling track rails 7, in accordance with known practice. In the drawings, I have indicated aligned lengths of rail 7, connected end to end by tie or joint bars 8 with associated through bolts 9 and lock-washers 10, see Fig. 4. The vehicle is adapted for self-propulsion or coupling connection to a suitable motorized car, the entire equipment being light enough in weight to permit of its easy placement on or quick removal from the track rails 7. It is intended that the vehicle be powered to travel at a uniform speed ranging from ten to fifteen miles per hour.

Mounted below and rigidly secured to the vehicle deck 5 is a suspension member or track rod 11, said rod being non-circular or polygonal in cross-section and having angularly directed end portions 12, 13 with terminal flanges 14, whereby said rod 11 is secured to the deck directly above and in spatial alignment with the longitudinal center line of the rails 7. The suspension rod 11 is provided, proximate its front end 13 with a stop collar 15 and, affixed thereto adjacent its rear end portion 12, is a movement-limiting switch 16 as shown, rod 11 affords resilient suspension for a supersonic flaw-detecting means, in the form of a small carriage comprehensively designated 17, in Fig. 4.

The carriage 17 comprises a holder or plastic block 18, Fig. 4 only, having cemented thereto, six quartz crystals 19, for example only, which are cushioned by sponge rubber 20 in a manner to provide the necessary strength and resiliency to absorb vibration and shock, said crystals being properly spaced with respect to corresponding points on the rail 7 for testing by supersonic waves, or at similar critical locations of each rail joint. For mechanical protection the crystals 19 are each, preferably, encased in a hardened steel inverted cup or cylinder 21, see Fig. 4, that is open at its lower end to confront the rail 7, but which will not actually contact said rail when the carriage 17 is lowered to active position. The necessary electrical coupling medium or contact between the crystals 19 and the rail 7 is made by water or kerosene oil, the liquid being distributed to each said crystal from a copper supply line, indicated at 22, having corresponding branches 23 respectively located in advance of each crystal 19. Application of the cou-

pling fluid is preferably electrically controlled by a contact 24 on the joint bar engaging finger 25, hereinafter described. The theoretical time of contact necessary for testing a point on a rail 7 does not exceed one ten-thousandth of a second, which eliminates any mechanical difficulty in providing the short time interval when the testing carriage 17 is stationary with respect to the rail 7, or during the actual making of the test or tests.

In order that the testing carriage 17 may be supported for progression along the rail 7, relative to the vehicle deck 5 as hereinbefore noted, the plastic block 18 is provided with vertical end projections 26 serviceable as rigid attachment means for rear and front guide bars 27, 28. Each of the guide bars 27, 28 has proximate its free end a suitable aperture 29 therethrough that affords slidable guidance for a vertically directed rod 30 equipped at its lower end with a castor-wheel 31 for free rotative coaction with the running surface of the rail 7. The upper end of each rod 30 is fitted with lock-nut means 32, and, intermediate the underside of each guide bar 27, 28 and the head 33 of the associated castor-wheel 31, said rod 30 is encircled by a helical spring 34, for a purpose later on set forth.

The plastic block 18 is also provided with spaced socket projections 35 for vertical sliding coaction with pendent pins 36 integral with, or rigidly secured to, a trolley device 37, fitted with insulate material bushings 38 having corresponding section bores for slidable coaction with the suspension or track rod 11, hereinbefore referred to. It is also to be noted that the trolley device 37 and the testing carriage 17 are connected together by an intervening tension spring 39 anchored at its ends thereto at 40 and 41 respectively. Carriage 17 is further equipped with rearwardly and forwardly sustained electromagnets 42, 43 respectively, in place of which any other suitable means such as an air clamp might be used. The trolley 37 also includes an upstanding post or projection 44 affording connection at 45 for one end a flexible element 46 which is trained over a freely rotative pulley 47 supported by the end portion 13 of the bar 11. The other end of flexible element 46 is attached at 48 to one end of a recoil spring 49 whereof the other end is connected to the suspension bar end portion 12 by an eye-bolt 50. Thus it will be readily understood that the spring 49 serves to normally hold the testing carriage 17 proximate the forward end of the vehicle deck 5.

The joint bar engaging finger 25, hereinbefore mentioned, is conveniently supported by a bracket 51 pendently attached to the vehicle deck 5, said bracket embodying a laterally directed portion 52 affording rigid support for a non-circular section bar 53. To the bar 53 the finger 25 is movably attached, by aid of an appropriate clamp 54 and securing means 55, whereby said finger 25 and clamp 54 are adjustable along the bar 53 as well as angularly up or down with respect to the joint bar 8.

It will now be readily apparent that in operation, the testing carriage 17 is attracted and held to the rail 7 by the electromagnets 42, 43 upon closing of the electrical contact on the bar finger 25 when the latter engages the joint bar 8 as indicated in broken lines at *a* in Fig. 2, and that such contact will keep said magnets energized until the carriage trolley 37 engages and trips the movement limiting switch 16. Upon de-energization of the magnets, the carriage 17 is

raised under the recoil action of the spring 49 with the assistance of the springs 34, which latter also function to maintain the castor-wheels 31 in running contact with the rail 7. Similarly it will also be understood that before the quartz crystals 19, of the testing carriage 17, actually contact the head surface of the rail 7, the coupling liquid, water or kerosene, is sprayed on said head surface by the pipe branches 23, as indicated by the dotted line 56 in Fig. 4, to insure proper conduction for the supersonic sound waves from the crystals 19 into the rail 7. It will furthermore be apparent that after the rail 7, regionally of the joint bar 8, is tested the vehicle has traveled forward relative to the track rod 11 through the slidable engagement therewith of the trolley 37, until said trolley engages the limit switch 16 with resultant de-energizing of the electromagnets 42, 43 and release of the testing carriage 17 for instantaneous elevation and return to its normal running position, as hereinbefore stated.

Attention is also directed to the fact that the testing carriage 17 is resiliently supported from the vehicle deck 5 and normally held at a uniform distance above the head surface of the rail 7 by aid of the castor-wheels 31, with capacity to yield and thus allow the quartz crystals 19 to contact said rail 7 when the electromagnets 42, 43 become energized. It is further to be understood that I may use a paint spraying device of the type disclosed in my prior Patent No. 2,282,929, dated May 12, 1942, in connection with the flaw-detecting means of the present invention for marking the rail 7, to visibly indicate the location of the flaws. Accordingly it is deemed unnecessary to herein further elaborate on this point.

From the foregoing the merits and advantages of my invention will be clearly apparent, but it is desired to point out that the proper timing sequence for the spraying of the contact coupling fluid, and the downward motion of the testing carriage 17, are determined by proper positioning of the contact 24 on the finger 25. An auxiliary switch operated by hand may, obviously, be used to prevent movement of the testing carriage 17 through frogs and rail switches but permit testing through highway crossings. Incidentally the electronic equipment—not shown—for testing is enclosed in a sealed box and mounted without additional housing on the vehicle deck 5. Furthermore, it will be readily understood that a testing carriage 17 may be provided at each side of the vehicle deck 5 for simultaneous testing of both rails of a track.

Finally it is to be understood that my invention is not limited to the precise disclosure hereinbefore set forth, since changes may be made in the form, construction and arrangement of the parts, without departing from the spirit and scope of said invention as more concisely defined in the following claims.

Having thus described my invention, I claim:

1. The combination in a flaw-detecting device of a vehicle adapted for travel on rail track; a suspension member spacedly below and rigidly secured to the vehicle deck; a testing carriage including trolley means, slidably mounted to the suspension member, to enable relative movement of the vehicle with respect to said carriage, and such carriage having wheels normally in running contact with said rail; supersonic means on the carriage for testing the rail regionally of the joint; electromagnets supported by the carriage which, when energized, attract and temporarily

5

hold said carriage rigidly against the rail while the vehicle continues in motion; and a movement limiting device carried by the suspension member controlling advance of said vehicle, relative to the carriage, during the actual testing interval.

2. The combination in a rail flaw-detecting device, of a vehicle adapted for travel on track rail; a suspension member mounted, spacedly below and rigidly attached to the vehicle deck; a carriage slidably mounted dependent from the suspension member for relative movement and including resiliently influenced wheels normally in running contact with the track rail; supersonic means carried by said carriage to effect the actual testing regionally of the rail joint; electromagnetic devices on the carriage which, when energized, attract and stationarily hold said carriage to the rail; and movement controlling switch means operative to limit advance of the vehicle, relative to the carriage, during the actual testing interval.

3. A flaw-detecting device for track rails comprising a vehicle adapted for travel on the rail; a suspension member spaced from and rigid with the vehicle deck; a wheeled carriage including a trolley slidable along the suspension member; supersonic means supported by said carriage to effect the actual testing for detection of flaws regionally of the rail joints; means operative to maintain the carriage wheels in normal running contact with the track rail and the flaw-detecting device elevated relative thereto; an electromagnet at each end of the testing carriage which, when energized, jointly attract and stationarily hold said carriage to the rail joints; and means controlling limited advance of the vehicle, relative to the testing carriage, while the latter is stationarily held during the actual testing interval.

4. A flaw detecting device for railroad track rails comprising a vehicle adapted for travel on said rails; a suspension member dependently rigid with the vehicle deck; a wheeled testing carriage including a block of suitable plastic having supersonic crystals in the rail head confronting surface; a trolley slidably engaged on the suspension member and having relatively movable connection to the aforesaid plastic block; means operative to maintain the testing carriage wheels in normal rolling contact with the track rail head; an electromagnet at each end of the testing carriage which, when energized, jointly attract and hold the carriage plastic block closely adjacent the top surface of the rail head; motion-limiting means controlling advance of the vehicle, relative to the testing carriage and the rail joint, during the actual testing interval, and to effect de-energizing of the electromagnets; and recoil means operative to return the testing carriage to its normal position.

5. The invention of claim 4 further including electrically controlled means effective to spray a fluid coupling medium onto the rail head, in advance of each crystal, to complete conduction contact between said crystals and the rail.

6. The invention of claim 4 wherein the suspension member is in the form of a non-circular section rod having angularly related end portions with terminal attaching flanges; and wherein said rod includes an adjustable stop collar adjacent one of the angular ends, and a movement limiting switch proximate the other angular end.

7. The invention of claim 4 wherein the testing carriage plastic block has spaced sockets in its underside zonal region of the rail joint bar; and

6

wherein each such socket houses one of the rail head confronting supersonic crystals with an interposed rubber cushion effective to absorb vibration and shock.

8. The invention of claim 4 wherein the testing carriage plastic block embodies spacedly aligned sockets formed in its rail confronting face for the associated supersonic signals; wherein an inverted cylindrical metal cup is suitably secured in each such socket; and wherein each said cup is equipped with an inner sponge rubber cushion and an outer attached quartz crystal.

9. The invention of claim 4 wherein the testing carriage plastic block embodies spaced upstanding socket projections that afford movable guidance for pins dependently rigid with the trolley, and vertical end projections providing support for aligned forward and rearward projecting bars; wherein said trolley device is connected to the plastic block by a tension spring; wherein the plastic block aligned forwardly and rearwardly projecting bars have their free ends respectively apertured for guidance of associated rods each having a castor device at its lower end; wherein a helical spring, intermediate the castor devices and the spacedly confronting bar ends, with lock-nuts engaged on the remote terminal portions thereof, above said bar ends, jointly serve to downwardly-influence such rods; and wherein the recoil means consists of a tension spring, anchored between the trolley and the testing carriage, normally holds the latter elevated with respect to the track rail.

10. The invention of claim 4 further including a bracket dependently secured to and below the vehicle deck in advance of the testing carriage; wherein said bracket embodies a laterally-directed portion affording rigid support for a non-circular section bar; wherein an appropriate clamp device is adjustably secured on said bar; and wherein an angularly-directed finger is carried by said clamp device with capacity for vertical adjustment and electric current conduction therethrough from the rail joint bar to the testing carriage electromagnets.

11. In rail flaw detecting apparatus, a vehicle adapted to travel on the rail; a guideway extending longitudinally of the vehicle; a detector device slidably connected to the guideway and supported in close proximity to the rail; holding means actuated upon engagement of a contact element with a joint bar connecting aligned rail sections for causing temporary arrest of the detector device over the rail joint; means automatically operative to cause release of the detector device by the holding means after a predetermined extent of travel of the vehicle; and means to return the detector device to its initial position.

12. In rail flaw detecting apparatus, a vehicle adapted to travel on the rail; a guideway extending longitudinally of the vehicle, a detector device slidably connected to the guideway and supported in close proximity to the rail; yielding means for normally maintaining the detector device at the forward end of the guideway; means actuated upon engagement of a contact element with a joint bar connecting aligned rail sections for causing temporary arrest of the detector device over the rail joint; and means automatically operative to cause release of the detector device by the holding means after a predetermined extent of travel of the vehicle for retraction to its normal position at the forward end of the vehicle by the yielding means.

7

13. In rail flaw detecting apparatus, a vehicle adapted to travel on the rail, a guideway extending longitudinally of the vehicle; a detector device slidable along said guideway and a yielding suspension means by which the detector device is normally supported out of contact with the rail; yielding means for normally maintaining the detector device at the forward end of the guideway; means by which the detector device is lowered into contact with the rail and held to the rail while the vehicle advances; and means adjacent the opposite end of the guideway arranged to be actuated by the carriage after a predetermined extent of travel of the vehicle to effect release of the detector device by the holding means for elevation from the rail by the suspension means and for retraction to its normal position at the forward end of the guideway by the yielding means.

14. In rail flaw detecting apparatus, a vehicle adapted to travel on the rail; a guideway extending longitudinally of the vehicle; a detector carriage slidably connected to the guideway and supported by a yielding suspension normally out of contact with the rail; electromagnetic means operative, when energized, to draw the carriage into contact with the rail; yielding means for normally maintaining the carriage at the forward end of the guideway; a switch on the carriage adapted to be closed for current flow to the electromagnetic means and holding of the carriage to the rail as the vehicle advances; and a limit switch adjacent the opposite end of the guideway arranged to be automatically actuated by the carriage after a predetermined extent of travel of

8

the vehicle to interrupt current flow to the electromagnetic means, for release of the carriage and retraction thereof to its normal position at the forward end of the guideway by the yielding means.

15. Rail flaw detecting apparatus according to claim 14, wherein the first mentioned switch has an actuating member which is operated by engagement with a joint bar connecting aligned sections of the rail.

16. Rail flaw detecting apparatus according to claim 14, further including means for releasing conducting fluid onto the rail in advance of the detector carriage at the time of energization of the electromagnetic means.

17. Rail flaw detecting apparatus according to claim 14, wherein the carriage comprises a block of insulation, a plurality of crystal elements respectively set, with interposition of rubber cushioning and their ends projecting, into metallic protective cups; and wherein the crystal-containing cups are recessed upwardly into said block at intervals therealong.

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