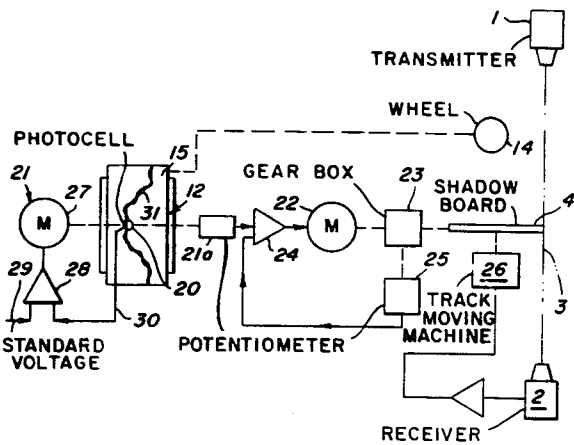


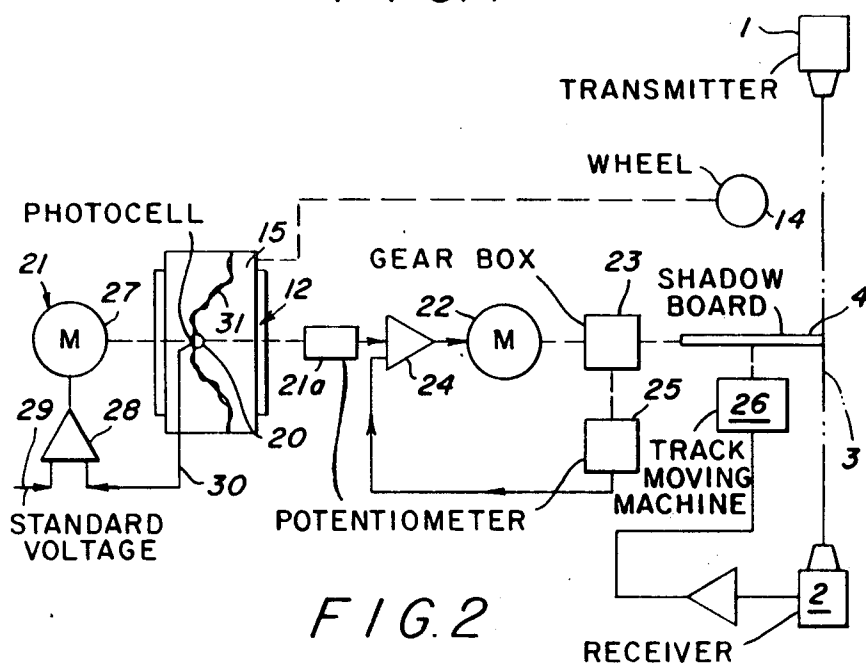
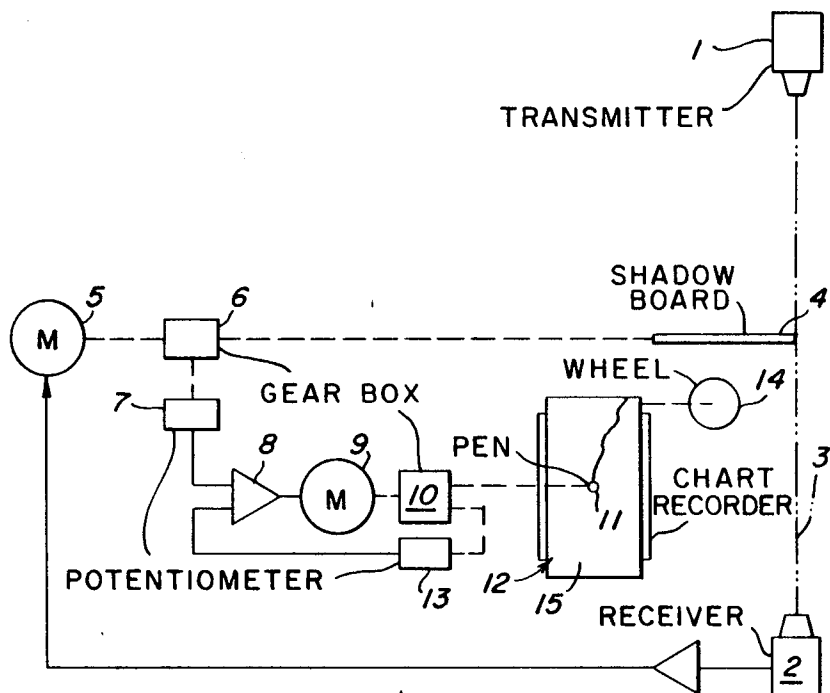
[72] Inventors **John Kenneth Stewart**
Columbia, S.C.;
William J. Tyler, Valois, Quebec, Canada;
Helmuth Rolf Erich von Beckmann,
Columbia, S.C.
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[73] Assignee **Tamper Inc.**
West Columbia, S.C.

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Primary Examiner—Arthur L. La Point
Assistant Examiner—Richard A. Bertsch
Attorney—Smart & Biggar

[54] **CHORD LINER**
3 Claims, 2 Drawing Figs.
[52] **U.S. Cl.**..... **104/8**
[51] **Int. Cl.**..... **E01b 32/02,**
E01b 35/10
[50] **Field of Search**..... **104/7, 7 B,**
7 A, 8, 12; 33/60

ABSTRACT: Apparatus for aligning railroad track providing automatic alignment to a visual representation appearing on a recording medium. Generally the invention provides apparatus comprising means mounting said apparatus for movement along a length of track, means for mounting a recording medium carrying a representation of the desired alignment condition of the length of track, means for following said representation, and means responsive to said following means for moving the track at a point in said length to correct misalignment of the track.





INVENTORS
 JOHN K. STEWART
 WILLIAM J. TYLER
 HELMUTH R. E. VON BECKMANN
Smart & Biggar
 ATTORNEYS

CHORD LINER

BACKGROUND OF THE INVENTION

This invention relates to the alignment of railroad track, that is, the correction of lateral errors in existing track.

There has been provided apparatus for aligning track in which the apparatus is first passed along a length of the track and the actual alignment condition of the track is recorded on a chart. In this known apparatus, the operator then constructs on the chart a desired alignment condition of the length of track. The apparatus is then passed over the length a second time and the track is aligned to the desired condition as appearing on the chart. Reference is made to Canadian Pat. No. 675,877 issued Dec. 10, 1963 to Nordberg Manufacturing Company. In such apparatus, the operator of the apparatus is required to stop the apparatus at a number of stations along the length of track during the second pass and to set up the apparatus at each station manually for this step of correcting the alignment of the track at that station by reference to the desired alignment shown in the chart. Use of an operator and manual setting up of the apparatus is time-consuming and is subject to operational errors.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide automatic alignment of track in apparatus such as that described above.

According to the invention, there is provided apparatus for aligning railroad track comprising means mounting said apparatus for movement along a length of track, means for mounting a recording medium, carrying a representation of the desired alignment condition of the length of track, means for following said representation and means responsive to said following means for moving the track at a point in said length to correct misalignment of the track.

In the preferred embodiment of the invention disclosed herein, the following means comprises a photocell which is mounted in the apparatus to follow a representation of the desired alignment on the chart of a chart recorder.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example only, with reference to one embodiment of the invention which is represented in the accompanying drawings in which:

FIG. 1 is a generally diagrammatic representation of the apparatus embodying the invention in a surveying mode; and

FIG. 2 is the apparatus of the embodiment of FIG. 1 in an aligning mode.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The apparatus illustrated in the drawings and described hereinafter comprises means both for correcting the actual alignment condition of a length of railroad track and means for correcting the alignment of that length of track after establishing the actual alignment condition. However, it will be understood that the present invention is concerned with the apparatus for aligning the track.

The apparatus as recited comprises reference line establishing means in the form of a radiation transmitter and a radiation receiver and a reference line detection means in the form of a shadowboard. Such apparatus is well known in the art and will not be further described except to point out that the transmitter and receiver are spaced along the length of the track and that the shadowboard is usually placed closer to the receiver than the transmitter. In the drawings, the transmitter is indicated by the numeral 1 and the receiver by the numeral 2 and the reference line therebetween by the numeral 3. The shadowboard is indicated by reference numeral 4.

In the surveying condition of the apparatus, the shadowboard is under the control of a motor 5 via gear box 6. In the surveying mode, the shadowboard may be maintained in a position in which it detects the reference line 3 by means of

signals derived from the receiver 2 and operating on the motor 5 by hunting about the reference line in a manner which is known in the art and will not be further described herein. It is to be noted that in the drawings, the solid lines represent electrical connections and the broken lines represent mechanical connections between the elements illustrated.

There is provided a mechanical connection between the gear box 6 and a potentiometer 7, the mechanical connection being such that the potentiometer produces a signal related to the movement of the shadowboard from a datum position. An electrical signal from the potentiometer is passed through a summing amplifier 8 to a motor 9 to a further gear box 10. The gear box 10 has a mechanical connection to a pen 11 of a chart recorder 12. A feedback from the gear box 10 through a potentiometer 13 to the amplifier 8 is provided so that the system 8, 9, 10 and 13 provides a feedback servosystem. A wheel 14 runs on the track at a point adjacent the shadowboard 4 and this wheel is mechanically connected to the chart recorder so that the chart 15 of the chart recorder moves under the pen 11 at a rate proportional to the movement of the apparatus along the track. It will be understood that the aforescribed apparatus provides means for actually creating a visual representation of the actual alignment condition of the track during a pass of the apparatus in the surveying mode along the track.

In FIG. 2 there is shown the alignment condition of the apparatus of this embodiment. Similar components have the same reference numerals. Accordingly, reference line establishing means in the alignment condition comprise the transmitter 1 and the receiver 2. A chart recorder is indicated by the numeral 12 and carries a chart 15. The chart is moved by the wheel 14. In the alignment mode, a photocell 20 is mounted above the chart of the chart recorder and is capable of moving laterally of the chart under the control of a circuit 21 which will be described below. The shadowboard is mechanically connected to a potentiometer 21a which converts the movement of the photocell to an electrical signal which controls movement of the shadowboard 4 through a motor 22 and a gear box 23. A feedback loop to a summing amplifier 24 is provided by way of a potentiometer 25 connected to the gear box 23 and feeding a signal to the amplifier 24. The shadowboard is mounted on that part of the apparatus comprising means 26 moving the track. The track moving means 26 is under the control of the signal received from the receiver 2.

The photocell is adapted to follow a representation of the desired alignment condition of the track drawn on the chart 15. The representation is drawn to have a width comparable with the dimension of the photocell aperture and with an ink to which the photocell is sensitive in relation to the characteristic of the paper. In contrast to this, the pen 11 used on the surveying and recording mode is connected to a reservoir (not shown in FIG. 1) containing an ink to which the photocell is insensitive. The circuit 21 controlling the movement of the photocell 20 comprises a motor 27 deriving a signal from summing amplifier 28. Into the amplifier is fed a standard comparator voltage at 29 and the output 30 from the photocell 20. In this way, the amplifier 28 passes a signal to the motor 27 when the signal 30 exceeds or is less than the standard comparator voltage input 29. The output from the photocell 20 will be dependent upon how much of the width of the representation 31 is covered by the photocell. Increasing coverage of the representation 31 will reduce the output signal from the photocell and cause the motor to move the cell away from the representation. Conversely, movement of the photocell too far from the representation will cause an increase in output from the photocell causing the motor to move the photocell towards the representation 31.

The operation of the apparatus shown and described above will now be explained.

In the surveying mode of the apparatus shown in FIG. 1, the operation is as follows. The apparatus is passed over a length

of track and in this pass the shadowboard 4 is maintained in a position of detection of reference line 3. This results in movement of the shadowboard 4 under the control of the motor 5 whose operating signals are derived from the receiver 2. Movement of the shadowboard causes movement of the pen 11 on the chart 15 through the action of the control means to the pen including the potentiometer 7 and the motor 9 and gear box 10. During the pass along the length of track, the wheel 14 causes movement of the chart under the pen 11 and there is traced on the chart a visual representation of the actual alignment condition of the track.

When the length of track which it is desired to align has been surveyed, the apparatus is stopped and returned to the starting position on the length of track. An operator then draws, through the irregular curve representing the actual alignment condition of the track, another representation which is the desired alignment condition of the track. The second representation may be a smooth curve averaging the errors noted in the actual alignment condition of the track or it may be an arbitrary curve representing an actual required form of track having the general parameters indicated by the representation of the actual alignment condition of the track.

When the apparatus has been returned to the starting position, the components of the apparatus are set up in the alignment mode of the apparatus as shown in FIG. 2. The apparatus is then passed over the length of track the second time but in this instance, it is stopped at predetermined intervals along the length of track. During travel between stations, the photocell is moved to locate the representation 31 as the chart 15 moves with movement of the apparatus. Movement of the photocell 20 to locate the line 31 moves the shadowboard to a position representative of the desired alignment condition of the track at the station as determined by the line 31. At each station the track is then moved, if necessary, at the location of the shadowboard 4 to place the track at the shadowboard 4 in a position in which the shadowboard 4 detects the reference line 3. This method of alignment of that station on the track to a reference line by movement of the shadowboard operatively connected to the track is well known in the art and will not be further described. During movement of the track between the stations, wheel 14 moves the chart 15 so that photocell is located above the chart at a point representative of the station arrived at.

As discussed earlier, the apparatus described above contains means for creating a visual representation of the actual

alignment condition of a length of track and means for following a representation of a required alignment condition of the track and means responsive to the following means to align the track at stations along the length of track. However, it will be understood that the apparatus of the invention may include only the components of the alignment condition of the apparatus described above. In such a case, the visual representation of the actual alignment condition can be derived from other apparatus and placed on the chart recorder 12 in the alignment mode of the present apparatus and the apparatus can then be passed over the predetermined length of track for aligning purposes.

What I claim as my invention is:

1. Apparatus for aligning railroad track comprising means mounting said apparatus for movement along a length of track, a chart recorder, a chart on the recorder carrying a representation of the desired alignment condition of the length of track, a photocell for following said representation on relative movement of photocell and chart, an electric motor for controlling said photocell, the electric power supply to the motor being the difference of electrical output from the photocell and a standard comparator voltage, and means responsive to said photocell movement for moving the track at a point in said length to correct misalignment of the track.

2. Apparatus for aligning railroad track comprising a track alignment correcting vehicle mounting said apparatus for movement along a length of track, means on said vehicle for mounting a recording medium carrying a representation of the desired alignment condition of the length of track; means for following said representation, means operatively connected to the following means for converting movement of the following means into an electrical signal representative of the movement of the movement of the following means; reference line establishing means including a radiation transmitter and a radiation receiver; shadow means between said receiver and transmitter; means for moving said shadow means in response to said signal; track moving means on said vehicle and operatively connected to the shadow means; and means to automatically operate the track moving means to move the track and shadow means thereon to place said shadow means in an interference position on the reference line.

3. Apparatus according to claim 2 wherein said moving means comprises an electric motor supplied with operating current proportional to said signal and a signal derived from the position of the shadowboard.

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