Jan. 16, 1968 F. PLASSER ET AL 3,363,582

TRACK GRADING

Filed March 15, 1965

Fig. 1

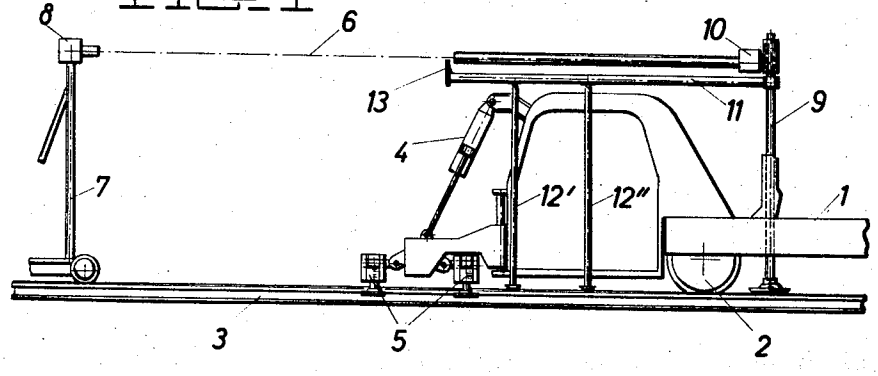


Fig. 2

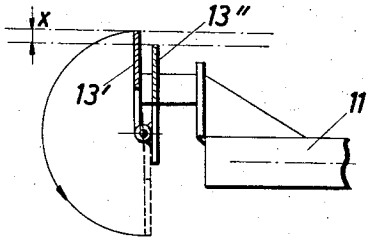


Fig. 3

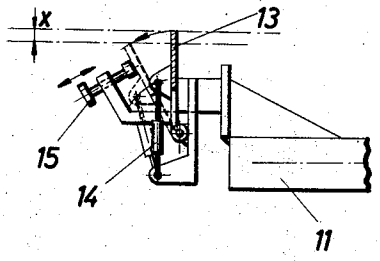
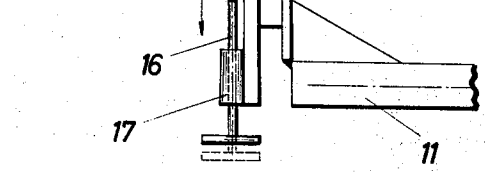


Fig. 4



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TRACK GRADING

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ABSTRACT OF THE DISCLOSURE

In track grading, wherein the grade is determined by contact between an upper edge of a control element and a reference line extending above the track, means for lowering the upper edge after a first contact.

The present invention relates to track grading and more particularly to improvements in the type of track grading operations wherein adjacent track sections are continuously graded with a mobile track grading apparatus whose operating movements are fully automated in a generally known manner.

In well known arrangements of this class, a reference line extends preferably above each rail of the track from a point above a previously graded track section forwardly over an adjacent track section to be graded. A support advantageously constituted by a mobile track tamping and lifting machine with wheels arranged for movement on the graded track section carries means forwardly of the wheels for raising the rails of the adjacent track section to a grade determined by the reference line or lines. A control element is supported on the adjacent track section whereby the control element is raised with the raising of the associated adjacent track section rail. The control element usually includes a spotboard having an upper edge and contact between this upper edge and the associated reference line automatically interrupts the raising of the associated rail, thus determining the grade of the adjacent track section rail.

The reference line may be constituted by a beam of radiated energy, such as visible light, infrared radiation or other electromagnetic energy, by a tensioned wire, which may be an electrical conductor, or any other suitable means constituting a straight line. The rail raising means may include any suitable jack or a rail gripping mechanism connected to an electrically operated hydraulic motor. As is well known in automated apparatus of this type, contact of the upper edge of the spotboard with the reference line, i.e. closing of an electric circuit constituted by the upper spotboard edge and an electrically conductive tensioned reference wire, or interruption of the radiated energy beam by movement of the upper edge across the beam, may instantly stop operation of the hydraulic motor and thus the raising of the rail.

In one conventional embodiment of such track grading apparatus, each rail is raised independently in respect of an associated reference line until an upper edge of an associated one of the control elements contacts the associated reference line and the superelevation of the track is measured after the rails have been raised, most simply by a transversely extending level.

Since modern, automated track grading of this type proceeds from tie to tie, the control of the superelevation uncovers no more than very minor errors, if any, requiring a slight further lifting of one of the rails in case of such grading errors.

It is the primary object of the present invention to improve the operation of the described type of track grading in case of such grading errors. It is a more specific object of this invention to enable an operator of such track grading apparatus to effectuate the desired correction with a single and simple move.

This and other objects and advantages are accomplished in accordance with the invention by providing means for lowering the upper edge means of the control element in relation to the track section whereon the control element is supported. In this manner, the operator may lower the upper edge means of the control element associated with one of the rails found at an undesirably low grade after the superelevation has been measured, thus causing this one rail to be raised again until the lowered upper edge means of the associated control element again contacts the associated reference line.

The objects, advantages and features of the present invention will become more apparent from the following detailed description of certain specific embodiments thereof, taken in conjunction with the accompanying drawing wherein

FIG. 1 is a schematic side view of a generally conventional grading apparatus showing only those portions of the apparatus directly cooperating with the improvement of this invention; and

FIGS. 2, 3 and 4 are enlarged side views, partly in section, of three specific structural embodiments of a spotboard useful for the practice of the invention.

Since the grading apparatus as a whole is well known, such parts as its track tampers and the electrical control circuit have been omitted entirely and other operating parts have been illustrated only schematically, to facilitate an understanding of the sole improvement wherewith the invention deals.

In FIG. 1, the mobile track grading apparatus is shown to comprise a support **1** having wheels **2** arranged for movement on rails **3**. The wheels move on a graded track section and means is mounted on support **1** forwardly of the wheels for raising the rails of a track section adjacent to the graded track section. One such rail raising means is associated with each rail and each includes rail gripping elements **5** which may be lifted by hydraulic motor **4**.

The reference line **6** of the illustrated embodiment is a beam of electromagnetic energy, such as a light beam, extending above each of the rails **3** from a point **10** above the graded track section forwardly over the adjacent track section to be graded. In the known structure illustrated herein by way of example, a bogie **7** is arranged on the track in advance of the track grading carriage **1** and carries a transmitter **8** of beam **6**. A beam receiver **10** constitutes the end point of the reference line **6** above the graded track section and is supported on the other end of the vertically extending support element **9** whose one end is supported on a rail **3** of the graded track section. As shown, the element **9** is a rod which is vertically slidably mounted in a bearing on support **1** and rests with a shoe on rail **3**.

The grading control element includes a horizontally extending support member **11** which is a bar whose one end is movably supported on rod **9** by means of a bearing sleeve sliding on the rod and whose other end supports a spotboard **13**. Support means constituted in the illustrated embodiment by vertically extending rods **12'**, **12''** support the forward end of the bar **11** on the rail **3** in the portion of the track section to be graded. In this manner, the control elements **11**, **13** is raised with raising of the track section to be graded.

The spotboard has an upper edge means and, in a manner well known per se and, therefore, not further described or illustrated, the hydraulic motor **4** is stopped and raising of rail **3** is accordingly halted automatically when the upper edge means of spotboard **13** passes through the plane of extension of reference line **6**, such contact causing instant stoppage of the motor while the motor oper-

ates to lift the rail grippers **5** as long as the upper edge means of the spotboard is out of contact with the reference line. As previously indicated, all of this structure and its automated operation are well known and require no further description.

Experience has shown, however, that occasional minor errors arise in the superelevation of a track graded in the indicated manner by independently raising the two rails of the track to respective predetermined grades. Transverse levels carried by the track grading machine constantly indicate the superelevation of the track and when the level reading indicates a slight error, one of the rails must be raised a little further to correct the superelevation. In accordance with the present invention, the operator can effectuate this very simply by lowering the upper edge means of the associated control element, thus automatically initiating operation of the hydraulic motor again until the lowered upper edge means again contacts the associated reference line.

Merely by way of example, FIGS. 2 to 4 illustrate three of the numerous structures useful in accomplishing the object of the invention. Many other structural embodiments will readily occur to the skilled in the art, the only requirement being to lower the contacting upper edge of the control element so that the lowered edge will cause instant continuation of the rail lifting operation without interruption in the continuously proceeding grading operation, as the apparatus advances from tie to tie along the track from the previously graded section into a section to be graded. In such an operation, the errors in superelevation at any one tie will be quite small so that the additional lifting of the one rail and the corresponding extent of the lowering of the control element will be of minor dimension. However, the error would become important if transferred and thus gradually increased from tie to tie without correction. Such a continuing increase in an erroneously graded track is simply and effectively avoided with the apparatus and method of the present invention.

In the structural embodiment of FIG. 2, the control element is shown to include a spotboard mounted at the forward end of support bar **11** and the upper edge means arranged for contact with reference line **6** includes a fixed upper edge on a first board **13''** and a movable upper edge on a second board **13'** movably supported on board **13''**. The movable upper edge extends in a plane above the fixed upper edge in a first position (shown in full lines) of the second board **13'**. In this position, the planes of the two upper edges are spaced by a distance x of quite minor length, which is determined by operating experience in the grading of like track sections.

As shown by the arcuate arrow, the board **13'** is mounted on means for moving this board so that the movable upper edge of the spotboard is below the plane of its fixed upper edge (see broken lines), the illustrated moving means being a pivot supporting the second board on the first board.

In the embodiment of FIG. 3, the spotboard **13** is pivoted to a bracket at the forward end of support bar **11**, which bracket also carries a solenoid **14** for pivoting the spotboard into selected positions providing desired distances x of the upper edge of the spotboard from its upright position shown in full lines. The selected positions of the spotboard and the corresponding position of the upper edge causing stoppage of the rail lifting operation in response to the contact of the upper edge with the reference line, may be controlled by an adjustable stop **15** also mounted on the bracket.

In FIG. 4, the spotboard **13** is mounted on a vertical guide rod **16** vertically adjustably supported on a bearing **17**. The vertical movement of the spotboard may be effectuated by any suitable means, including solenoid means, hydraulic motor means or mechanical linkage means.

Many structural modifications and variations will be obivous to those skilled in the art and the present invention is concerned neither with specific means for lowering a structural element or with specific grading apparatus or controls, except inasmuch and insofar as they constitute an essential part of the described combination, the essence of this invention residing in a simple residual adjustment of a graded rail in automatic response to the lowering of a control element used to stop lifting of the rail in response to the contact of the control element with a reference line.

We claim:

1. A mobile track grading apparatus comprising a support arranged for movement on a graded track section, a reference line extending above the track from a point above the graded track section forwardly over an adjacent track section to be graded, means mounted on said support for raising a rail of the adjacent track section to a grade determined by said reference line, a control element supported on the adjacent track section whereby the control element is raised with the raising of said adjacent track section rail, said control element comprising a spotboard having an upper edge means, the upper edge means including a fixed upper edge on a first board and a movable upper edge on a second board movably supported on said first board, the movable upper edge extending in a plane above the fixed upper edge in a first position of the second board, and means for moving the second board to move the movable upper edge below the plane of the fixed upper edge, contact between said upper edge means and said reference line determining the grade of the adjacent track section rail.

2. The mobile track grading apparatus of claim **1**, wherein said moving means is a pivot supporting the second board on the first board.

3. A mobile track grading apparatus comprising a support having wheels arranged for movement on a graded track section, a reference line extending above the track from a point above the graded track section forwardly over an adjacent track section to be graded, a vertically extending support element having one end supported on a rail of said graded track section and another end supporting said reference line point, means mounted on said support forwardly of said wheels for raising said rail of the adjacent track section to a grade determined by said reference line, a control element including a horizontally extending support member having one end movably supported on the vertically extending support element and a spotboard supported on the other end of said support member, support means supporting the support member on the adjacent track section rail whereby the control element is raised with the raising of said adjacent track section rail, said spotboard having an upper edge means, contact between the upper edge means and said reference line determining the grade of the adjacent track section rail, and means for lowering the upper edge means of the spotboard in relation to the support member and thereby to the track section whereon the support member is supported.

4. A mobile track grading apparatus comprising a support arranged for movement on a graded track section, a reference line extending above the track from a point above the graded track section forwardly over an adjacent track section to be graded, means mounted on said support for raising a rail of the adjacent track section to a grade determined by said reference line, a control element supported on the adjacent track section whereby the control element is raised with the raising of said adjacent track section rail, said control element comprising a spotboard having an upper edge, contact between said upper edge and said reference line determining the grade of the adjacent track section rail, and means for pivoting the spotboard into selected positions to lower the upper edge of the spotboard in relation to the track section whereon the spotboard is supported.

5. The mobile track grading apparatus of claim 4, further comprising an adjustable stop for limiting the pivoting movement of the spotboard.

6. A mobile track grading apparatus comprising a support arranged for movement on a graded track section, a reference line extending above the track from a point above the graded track section forwardly over an adjacent track section to be graded, means mounted on said support for raising a rail of the adjacent track section to a grade determined by said reference line, a control element supported on the adjacent track section whereby the control element is raised with the raising of said adjacent track section rail, said control element comprising a spotboard having an upper edge means, contact between said upper edge means and said reference line determining the grade of the adjacent track section rail, and a bearing vertically adjustably supporting the spotboard for lowering the upper edge means of the spotboard in relation to the track section whereon the spotboard is supported.

7. A method of grading a track having two rails, comprising the steps of extending a reference line above each of said rails from a previously graded track section forwardly over an adjacent track section to be graded, supporting a track grading control element on each of said rails in said adjacent track section adjacently to a respective one of said reference line, raising each of said rails in the adjacent track section until an upper edge of

an associated one of said control elements contacts an associated one of said reference lines, measuring the superelevation of the track after the rails have been raised, lowering the upper edge of the control element associated with one of said rails found at an undesirably low grade after the superelevation has been measured, and raising said one rail until the lowered upper edge of the associated control element contacts the associated one of said reference lines.

8. A method of grading a track having two rails, comprising the steps of extending a reference line above one of said rails from a previously graded track section forwardly over an adjacent track section to be graded, supporting a track grading control element on said one rail in said adjacent track section adjacently to said reference line, raising said rail in the adjacent track section until an upper edge of the control element contacts said reference line, and lowering the upper edge of the control element out of contact with the reference line.

References Cited

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