United States Patent

[11] 3,594,912

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[33] **Switzerland**
[31] **7267/68**

[54] MEASURING APPARATUS FOR THE GEOMETRIC CHECKING AND/OR CORRECTION OF RAILROAD TRACKS

9 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **33/174 R,** 33/145
[51] **Int. Cl.** **G01b 5/20**
[50] **Field of Search** ..... 33/144-—146, 174 A, 180 A, 60, 1 R

[56] **References Cited**

UNITED STATES PATENTS

3,263,332	8/1966	Plasser et al.	33/1 R
3,344,530	10/1967	Oville	33/174 A

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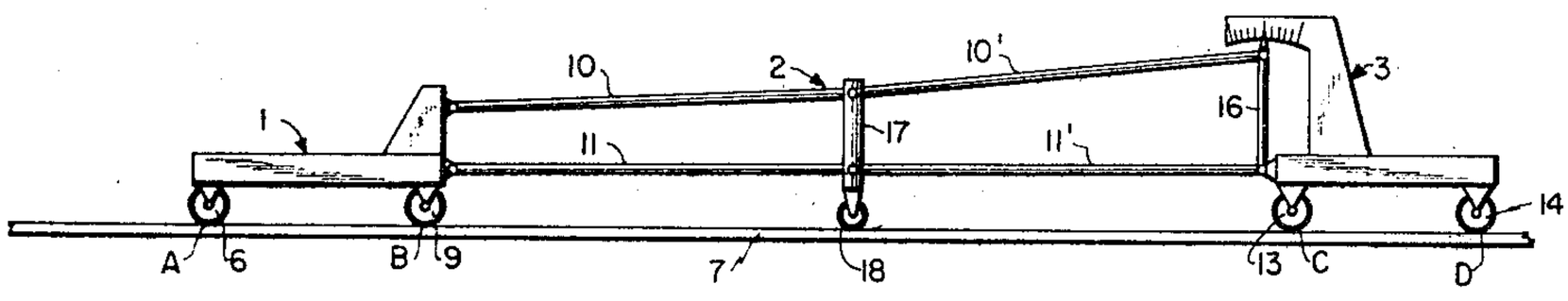
ABSTRACT: There is disclosed a measuring apparatus for the geometric checking or correction of railroad tracks, which is of the type incorporating two measuring means extending in the lengthwise direction of the track. A deformable mechanism serves to operatively interconnect the two measuring means, each of which bears upon at least one of both rails of the railroad track. The deformable mechanism incorporates at least two converging rod members. The one respective end portions of the two converging rod members are pivotably connected with one of the measuring means through the agency of a movable element and the opposite end portions of these two converging rod members are pivotably connected with the other measuring means.



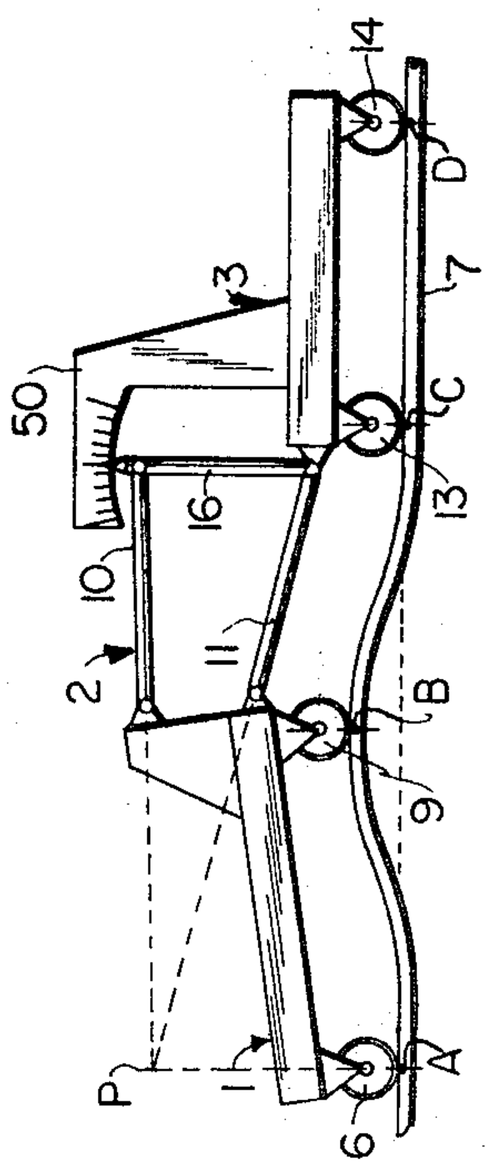


FIG. 4

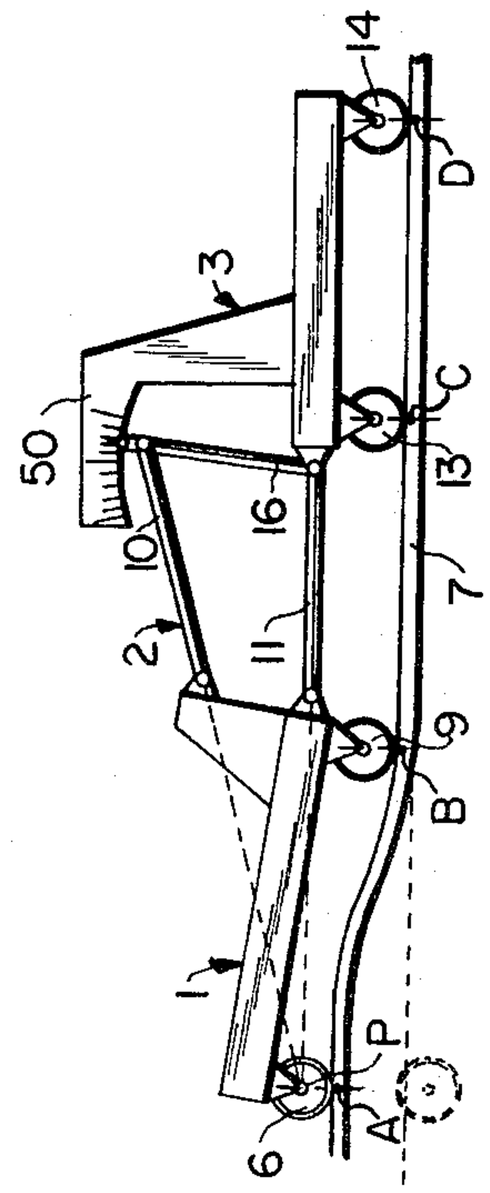


FIG. 5

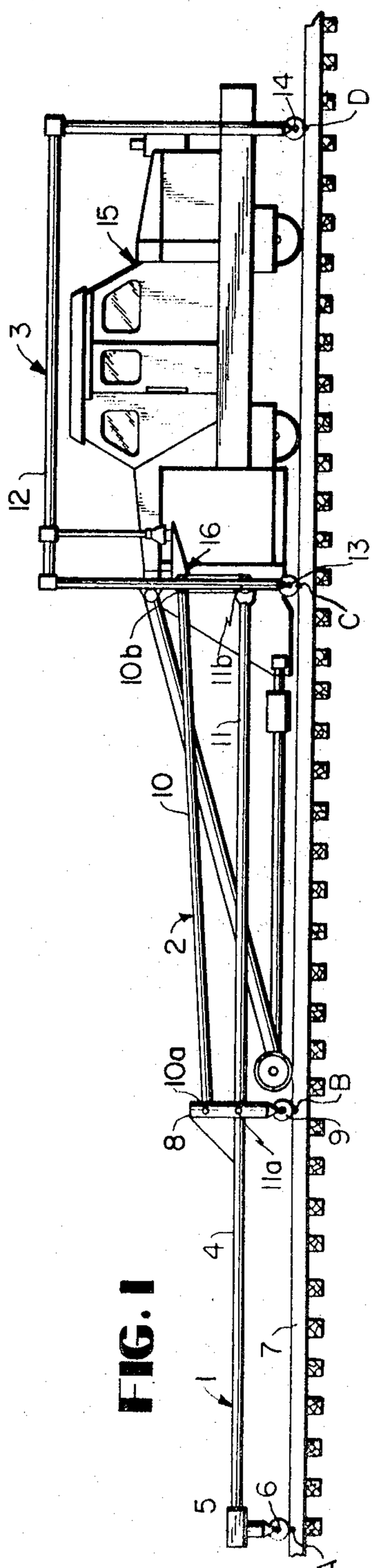


FIG. 1

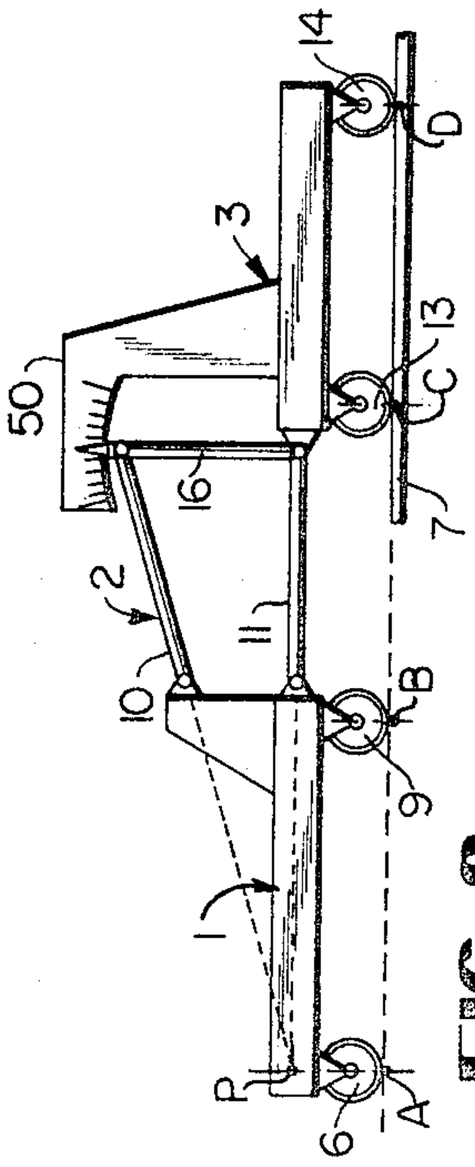


FIG. 2

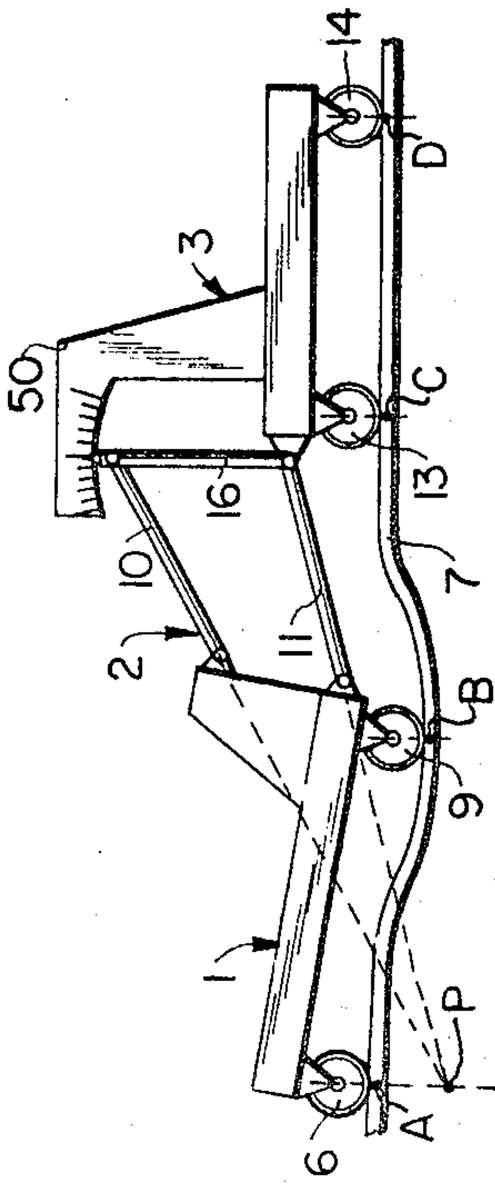


FIG. 3

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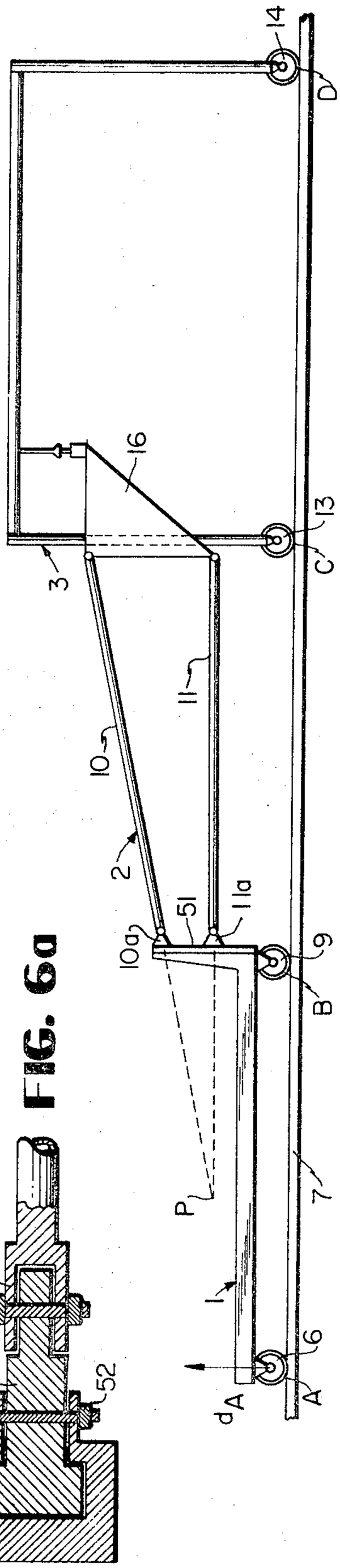

FIG. 6

FIG. 6a

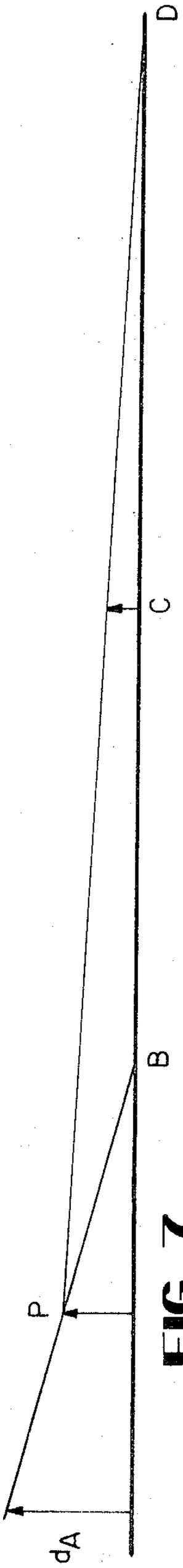

FIG. 7

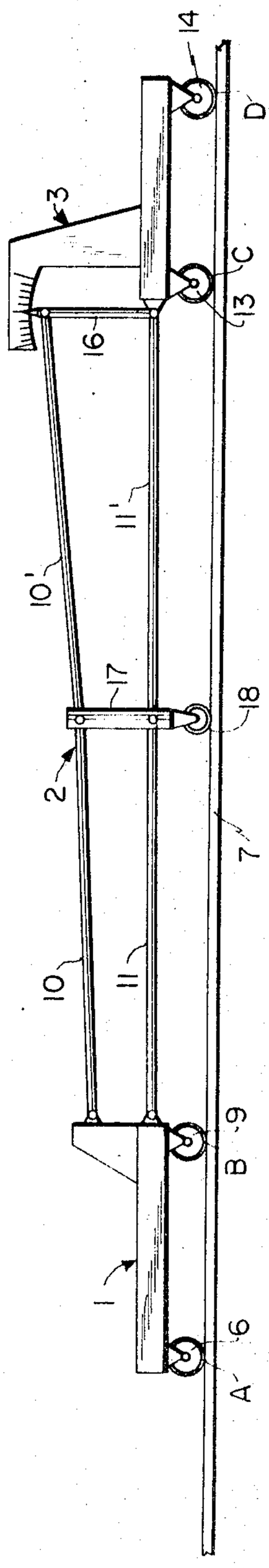

FIG. 8

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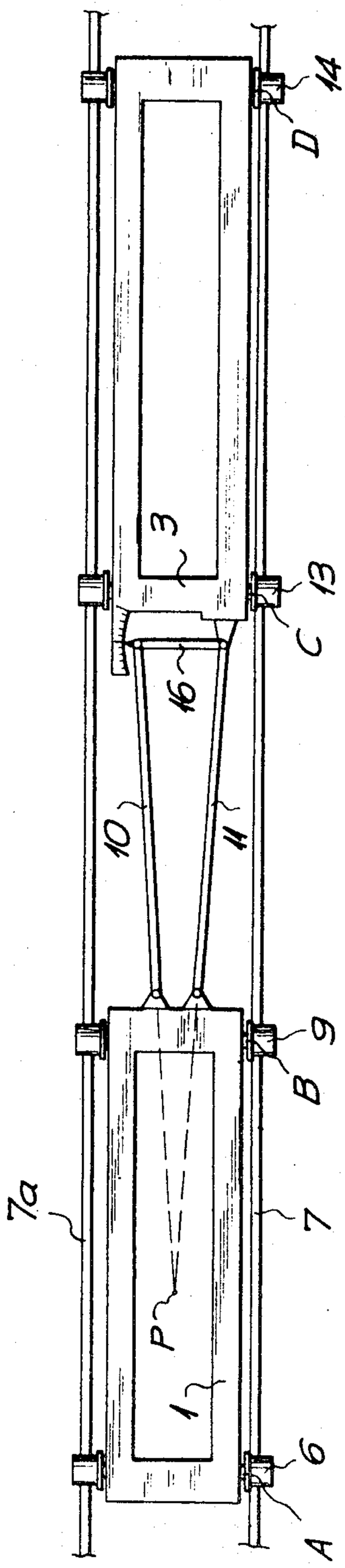

FIG. 6b

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MEASURING APPARATUS FOR THE GEOMETRIC CHECKING AND/OR CORRECTION OF RAILROAD TRACKS

BACKGROUND OF THE INVENTION

The present invention broadly relates to track maintenance equipment and, in its more specific aspects, concerns an improved measuring apparatus for the geometric checking and/or correction of railroad tracks.

The work required for the maintenance of railroad tracks has a real need for machines which are suitable for checking the geometric condition of the track and, if need be, for correcting this condition. It is for these reasons that modern track maintenance machines are equipped with different measuring systems. The most widespread used systems employ a reference datum which is movable along the track with the machine.

The use of a relative reference datum enables the measurement of errors appearing at the lengthwise profile of the track and, consequently to reduce such to a certain degree.

Attempts have been made to improve the results obtained with the aid of relative reference datums in that there are employed reference datums of very great length. However, such datums are composed of very long elements, so that the entire structure from which the datum is materialized, is exceptionally flexible and subjected to oscillations or vibrations which impair proper functioning.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide an improved measuring apparatus of the aforementioned type which effectively overcomes the previously mentioned drawbacks associated with the prior art constructions.

Another, more specific object of the preset invention relates to improved measuring apparatus for the geometric checking and/or correction of railroad tracks in a relatively simple, accurate and reliable fashion.

Still a further noteworthy object of the present invention relates to an improved type of measuring apparatus for the geometric checking, correction, or both, of railroad tracks in a relatively simple manner in relation to the prior art techniques used for this purpose, and wherein the apparatus structure is extremely economical to manufacture, relatively easy to use, and provides for accurate results.

Now, in order to implement these and still further objects of the present invention, which will become more readily apparent as the description proceeds, the inventive measuring apparatus is manifested by the features that it incorporates two measuring means or devices which extend in the lengthwise direction of the track and which are operatively interconnected with one another by means of a deformable mechanism. Each measuring device is supported upon at least one of both rails of the track, with the position of each measuring device being determined by two reference points. According to an important aspect of the invention, the deformable mechanism embodies at least two converging rod members, of which the one ends thereof are pivotably connected with one of the measuring devices and the opposite ends thereof with the other measuring device through the agency of a movable element.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood, and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. **1** is a schematic side view of a first embodiment of inventive measuring apparatus for the geometric checking and/or correction of railroad tracks;

FIGS. **2** to **6**, inclusive, schematically depict the operation of the measuring apparatus shown in FIG. **1**;

FIG. **6***b* schematically depicts a further arrangement of the converging rod members in a plane substantially parallel to the plane of the track;

FIG. **7** is a graphic illustration serving to explain the operation of the measuring apparatus of FIG. **1**; and,

FIG. **8** is a schematic side view of a modified form of inventive measuring apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, the exemplary illustrated embodiment of inventive measuring apparatus depicted in FIG. **1** will be seen to comprise three different successively arranged elements **1**, **2** and **3**. In the description to follow, the elements **1** and **3** each defining a reference datum will each be conveniently referred to as a measuring device or means and the remaining element **2** as a deformable mechanism. The measuring device **1** will be seen to datum **1**. consist of a long tubular member **4**, the front end **5** of which is secured to a roller member **6**. Roller member **6** bears upon the rail **7** at the support point A. The other or opposite end of the tubular member **4** is secured to a carriage **8** which bears by means of a roller **9** at support point B upon the rail **7**. Points A and B define the terminal points of a straight line of the corresponding reference datum **1**.

Considering now the element **2**, namely, the deformable mechanism, it will be seen that such embodies two converging rod members **10** and **11**. These rod members **10**, **11** which are situated above one another, are pivotably connected at locations **10***a* and **11***a*, respectively, with the carriage **8** and are connected with a movable measurement element or portion **16** of the measuring device **3**.

Now, the measuring device **3** will be seen to be composed of a frame unit **12**, the front region of which bears by means of a roller **13** at support point C and the rear end of which by means of a roller **14** at support point D upon the rail **7**. Points C and D define the terminal points of a straight line of the other corresponding reference datum **3**. Frame unit **7** is rigidly connected with a track maintenance machine **15** and supports, pretty exactly over the point C, the rotationally movable mechanism **16**. The neighboring ends of both rod members **10** and **11** are articulated at **10***b* and **11***b*, respectively, with this rotationally movable mechanism **16**. Mechanism **16** can, for instance, be an indicating device, a control device for correcting the position of the track, or a combination of these two type units. Hence, from what has been stated above, it will be seen that the measuring device **3** defines a first reference datum supported at the points C and D defining a straight line, and the other measuring device **1** defines a second reference datum supported at the points A and B likewise defining a straight line.

According to an important aspect of this invention, the depicted apparatus structure utilizes quite advantageously the characteristics of the converging rod members **10**, **11**. The mode of operation is readily understandable by making reference now to FIGS. **2** to **7**, inclusive. It will be understood that point P represents the point of intersection or convergence of the extensions of the converging rod members **10** and **11**. It is assumed that this virtual or imaginary point P is located vertically above the point A. The rollers **6**, **9**, **13** and **14** are situated in aligned fashion upon a straight line, as best observed by referring to FIG. **2**. Furthermore, it is presupposed that the rail member **7** is deformed at the point B, that is to say at the location where the roller member **9** bears, as schematically indicated for instance in FIGS. **3** and **4**. Owing to the articulated mounting of the rod members **10** and **11** the movable mechanism or element **16** is not influenced. On the other hand, if the rail member **7** is deformed at the location A, as indicated in FIG. **5**, then this mechanism **16** indicates the displacement of such point A. It will be seen from FIG. **5** that such displacement of point A can be represented or shown at a suitable graduated scale **50**.

Consequently, it will be observed that the measuring mechanism **16** measures the displacement of the element or

measuring device 1 above the imaginary point P wherein such displacements are measured with respect to the reference line through both of the points C and D. Consequently, when the point P is located above the point B, then, the mechanism **16** will measure the displacements of the point B, and the displacements or shifting of the point A naturally will not have any influence. Thus, by selecting the convergence point of the rod members **10** and **11**, it is possible to randomly vary the influence of the points A and B upon the indication of the mechanism **16**.

If the apparatus of the invention is used in conjunction with a machine for the correction of the track position, then it enables considerable reduction in the influence of local track errors upon the corrections carried out by the machine **15**, since the measurements are not with respect to a point, rather are based upon an error which is determined from a number of measurement points. This is so because the measurement is not undertaken at a point, rather is determined as an average value of a number of error determinations performed at different points. In actuality, if one assumes that the track is deformed at point A of FIG. **6**, as well as if it is assumed that the imaginary point P is located at the depicted position of FIG. **6**, then from FIG. **7** it will be recognized that the effect of the error d_A upon the position of the imaginary point P is reduced and that the reduction is still even more pronounced at point C.

The apparatus according to the invention possesses the advantage that it has a long measuring datum or basis, without exhibiting the drawbacks previously discussed such as susceptibility to oscillations and deformability.

The invention also contemplates that the hinge points **10***a*, **11***a* for the rod members **10**, **11**, respectively, can be mounted at an adjustable support **51** (FIG. **6**) at the carriage **8**, in order to provide the possibility of varying the point of convergence P of such rod members **10** and **11** and therefore to conveniently change the position of this imaginary convergence point P. It will be seen from FIG. **6***a* that the adjustable support **51** includes a dovetail slot for slidably receiving, for selective vertical adjustment, the ends **10***a* and **11***a* of the rod members **10** and **11**, respectively, which then can be fixed in desired position by a wedge means **52** or the like.

Finally, in accordance with a further embodiment of the invention, as best recognized by referring to FIG. **8**, the deformable element or mechanism **2** consists of two pairs of rod members **10**, **11** and **10'**, **11'**. It will be seen that these rod pairs **10**, **11** and **10'**, **11'** are arranged in alignment behind one another in succession and are interconnected with one another by intermediate support or carriage **17**. Carriage **17** bears upon the track **7** through the agency of a roller **18**. Furthermore, it is also possible to use an element or deformable mechanism **2** which consists of more than two pairs of rod members, which, in turn, are operatively interconnected with one another through a suitable number of intermediate carriages or supports, such as the ones shown by reference character **17**. Such an arrangement enables the element **2** to be appreciably lengthened without necessitating the use of extremely long connecting rods.

It will be understood that for convenience, the apparatus according to the invention, has been depicted and described with respect to a single track rail, yet it should be clear that each of both elements **1** and **3**, the measuring devices, can bear upon both rails of the railroad track, whereby their position will be determined by two points at each track rail. In such case, the rods **10** and **11** can be connected with the elements **1** and **3** at locations situated at the central plane of the track.

Furthermore, for measuring during track-lining operations, it is possible to replace the superimposed rod members **10** and **11** by converging rod members which are situated in a plane which is parallel to the plane of the track, as best shown by referring to FIG. **6***b*.

Finally, it is mentioned that the apparatus of the invention can be associated with a track maintenance machine and can control the correction work carried out by such a machine; however, it can also be used as an independent measuring apparatus.

It should be apparent from the foregoing detailed description, that the objects set forth at the outset of the specification have been successfully achieved.

I claim:

1. A measuring apparatus for the geometric checking and/or correction of railroad tracks incorporating spaced rails, comprising two measuring means defining two reference datums extending in the lengthwise direction of the track, said measuring means bearing upon at least one track rail, one of said measuring means defining a first reference datum bearing upon two points along the track rail, which points define a straight line, the other of said measuring means defining a second reference datum bearing upon two other points of the track rail defining another portion of a straight line, a deformable mechanism incorporating at least two converging rod members and defining a linkage mechanism for operatively interconnecting with one another said first reference datum and said second reference datum defined by said measuring means, said converging rod members being connected in the direction of their converging ends with said measuring means defining said second reference datum, a measuring element movably connected with said first reference datum defined by said one measuring means, the diverging ends of said rod members being articulated with said movable measuring element, said converging rod members converging at a point selected to be disposed perpendicular to a point of the track rail situated forwardly of said first reference datum and at or with said points defining the portion of said straight line defining said second reference datum.

2. A measuring apparatus as defined in claim **1**, wherein said converging rod members are arranged above one another.

3. A measuring apparatus as defined in claim **1**, wherein said converging rod members are arranged in a plane which is perpendicular to the plane of the railroad track.

4. A measuring apparatus as defined in claim **1**, wherein said converging rod members are arranged in a plane which is substantially parallel to the plane of the railroad track.

5. A measuring apparatus as defined in claim **1**, further including means for adjusting the point of intersection of said converging rod members.

6. A measuring apparatus as defined in claim **1**, wherein one end of one of said rod members is secured to said movable measuring element at a location at which said movable measuring element is connected with said one measuring means which carries said movable measuring element.

7. A measuring apparatus for the geometric checking and/or correction of railroad tracks incorporating spaced rails, comprising two measuring means extending in the lengthwise direction of the track, a deformable mechanism for operatively interconnecting said two measuring means, each measuring means bearing upon at least one of the rails of the railroad track, the position of each measuring means being determined by two reference points, said deformable mechanism incorporating at least two converging rod members, a movable element cooperating with one of said two measuring means, the one end portions of said two converging rod members being pivotably connected via said movable element with said one measuring means and the opposite end portions of said two converging rod members being pivotably connected with the other measuring means, said deformable mechanism comprising a number of successive pairs of aligned rod members, intermediate support means for interconnecting successive pairs of rod members with one another, said intermediate support means bearing upon said rails, said rod members being pivotably connected with their associated intermediate support means, the respective free ends of the first and last pair of rod members of said successive pairs of rod members being pivotably connected with a respective one of said two measuring means.

8. A measuring apparatus as defined in claim 7, wherein said first pair of rod members is pivotably connected via said movable element with said one measuring means and said last pair of rod members is pivotably connected with said other measuring means.

9. A measuring apparatus as defined in claim 1, wherein each measuring means bears upon both rails of the railroad track, and wherein the position of each measuring means is determined by two reference points at each track rail.