United States Patent

Plasser et al.

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[54] **TRACK CORRECTION AND TAMPING MACHINE**

[72] Inventors: **Franz Plasser; Josef Theurer,** both of Johannesgasse 3, 1010 Vienna, Austria

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[51] **Int. Cl.** **E01b 27/17**

[58] **Field of Search** ....104/7, 7 A, 7 B, 8; 105/393

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Primary Examiner—Arthur L. La Point
Assistant Examiner—Richard A. Bertsch
Attorney—Kurt Kelman

[57] **ABSTRACT**

A universal tamper comprises a track leveling and lining tool mounted between the front and rear axles of an elongated machine frame. The distance of the front axle from the track correction tool and the rear axle is variable. The tamper has a reference system for the track correction.

20 Claims, 5 Drawing Figures

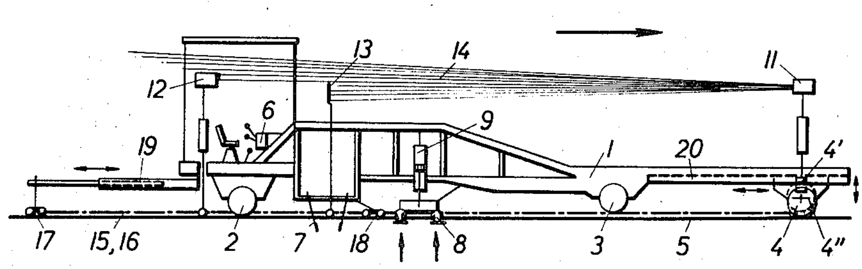

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FIG. 1

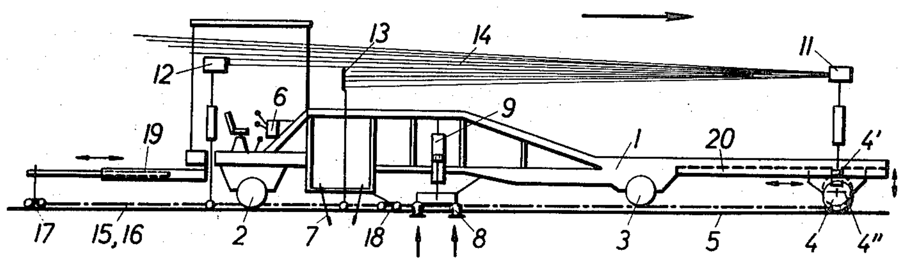


FIG. 2

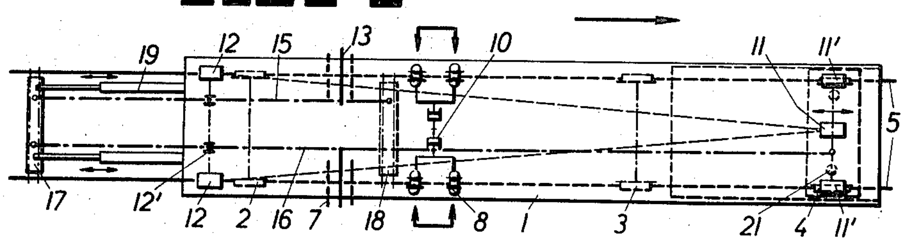


FIG. 3

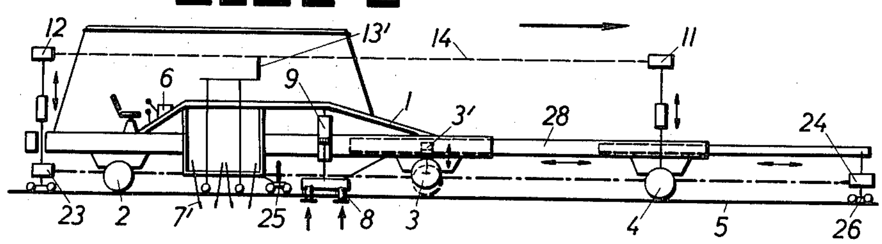


FIG. 4

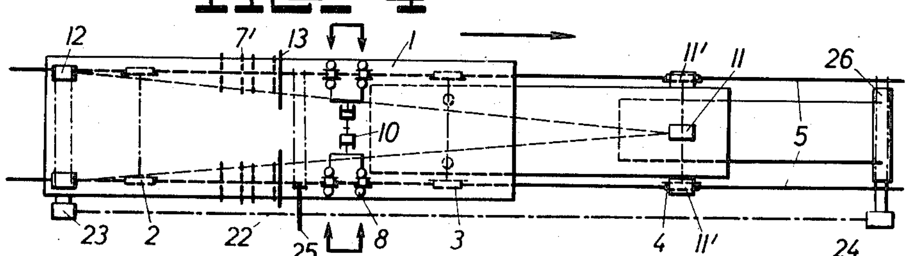
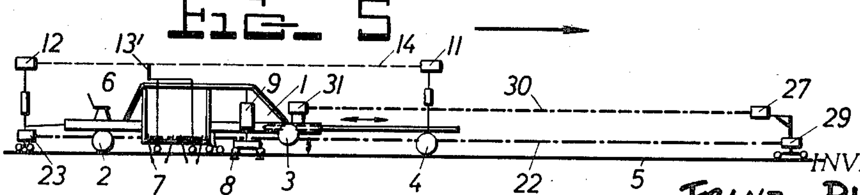


FIG. 5



INVENTORS
FRANZ PLASSER
BY JOSEF THEURER
AGENT

TRACK CORRECTION AND TAMPING MACHINE

The present invention relates to a mobile track correction and tamping machine, preferably usable for track leveling and lining.

Machines of this type have been built with an elongated machine frame supported for mobility on the track on a front and rear axle or running gear, the distance between the front and rear axles providing a long wheel base. Track tamping as well as correction means including track lifting and preferably lining means may be mounted on the machine frame between the front and rear axles, and a reference system is provided for the track correction.

In known machines of this type, the track tamping and correction means were usually mounted about equidistant between the machine axles or running gears. In such machines, the machine frame had to have a certain minimum length to make it possible to lift the track sufficiently by track lifting means mounted on the frame and without counter-support on the ballast because the maximal lifting stroke is necessarily determined by the distance of the machine axles, i.e. the distance of those track points which are pressed down by the heavy weight of the machine from the track point where lifting is effected therebetween. However, an excessive length of the machine frame has certain disadvantages, such as a wrong position of the track correction means in track curves, sagging of the long frame between the axle supports, and a generally difficult maneuverability of the machine.

Therefore, it has been preferred to mount the track lifting means in track tamping-leveling machines on a front portion of the machine frame freely overhanging the track section to be leveled or graded. Since the track section being lifted is free of any weight in such machines, the lifting stroke is in no way limited as long as the track lifting means is sufficiently spaced from the front axle of the machine whence the overhanging machine frame portion extends.

However, this type of tamper has various disadvantages compared to the first-described type of machine. With the tamping and track correction means mounted on the machine frame between the axles thereof, the weight of the machine is better and more evenly distributed over the track section to be corrected, thus avoiding excessive correction movements of the track which may be produced in a freely moving track section and are prevented when this track section is pinned down, as it were, at its end points determined by the two machine frame axles. Track deformations due to the correction movement are particularly prevalent at high temperatures which make the rails more flexible. When the track correction means is mounted between the axles, the track rails cannot move ahead or behind the correction point, and a more accurate and longer-lasting track correction is made with such a machine.

It is accordingly a primary object of this invention to make use of the advantages of machines of the first-described type while avoiding its disadvantages mentioned hereinabove.

It is a concomitant object of the invention to make such a machine universally useful for track work requiring small and large lifting and/or lining strokes, and in straight and curved track sections, without an excessive length of the machine frame.

These and other objects are accomplished in accordance with an essential characteristic of the present invention by making the distance of the front axle from the rear axle and the track correction means variable for selecting it according to prevailing track conditions so as to be adapted to the maximal lifting stroke required at any given track point.

For instance, while the machine is moved from one working site to another and where a leveling operation requires only minimal lifting strokes, the distance between the axles will be varied to be at a minimum. Where a track leveling operation requires relatively large lifting strokes and in a track laying operation, the distance will be increased to produce the required distance between the track correction means and the front axle.

Throughout the specification and claims, "front" and "rear" designate a position in relation to the working direction of the machine along the track elongation.

In accordance with one preferred feature of this invention, the track tamping means is mounted on the machine frame closer to the rear than the front axle or running gear so that, as in the machine type with the overhanging machine frame front portion, the track immediately behind the tamping is held down firmly by the machine weight resting on the rear axle.

The distance of the front axle from the rear axle and the track correction means may be varied in different ways. According to one embodiment of the invention, the front axle is longitudinally adjustably mounted on the machine frame for this purpose. However, it may be structurally simpler to provide a second front axle longitudinally spaced from the first mentioned front axle. At least one of the front axles may then be vertically adjustable out of engagement with the track so that only a selected front axle supports the frame for mobility on the track, the distance between the front and rear axles depending on which front axle has been selected. Either the foremost or the other front axle may be vertically adjustable. It is essential in either case that the selected front axle is an axle capable of bearing the load of the machine frame, and carries this load when selected to engage the track.

To assure the stable and solid connection of the selected weight-supporting front axle with the machine frame it is to support, means is preferably provided for mechanically retaining the vertically adjusted front axle in an adjusted vertical position. A double acting hydraulic jack constitutes a useful vertical adjusting and retaining means.

The above and other objects, advantages and features of the present invention will become more apparent in the following detailed description of certain now preferred embodiment thereof, taken in conjunction with the accompanying drawing wherein

FIG. 1 is a schematic side view of one embodiment of a machine according to this invention;

FIG. 2 is a top view of FIG. 1;

FIGS. 3 and 4 are views similar to that of FIGS. 1 and 2 of another embodiment; and

FIG. 5 is a schematic side view, on a smaller scale, of yet another embodiment.

Referring now to the drawing, like reference numerals are used in all figures to designate like parts functioning in a like manner to avoid redundancy in the description.

Referring first to FIGS. **1** and **2**, there is shown an elongated machine frame **1** supported for mobility on the track **5** by two of three axles or running gears, i.e. rear axle **2** and a selected one of front axle **3** or **4**, front axle **4** constituting the foremost axle of the machine.

A schematically indicated, vertically adjustable tamping unit **7** for tamping a tie is mounted on the frame **1** immediately in front of the operator's cab **6** and closer to the rear axle **2** than to either one of the front axles.

Immediately adjacent the track tamping means, which may be entirely conventional, a track correction means **7** is mounted on machine frame **1**. The track correction means includes a conventional unit of two pairs of roller clamps **8** per rail, the roller clamps moving directly under the head of the rails and gripping the same glidingly at two points. The unit of rail engaging roller clamps is operated for track lifting by a hydraulic jack **9** and for track lining by a hydraulic jack **10**, as is conventional.

Furthermore, the machine includes a conventional reference system for leveling and for lining the track. This system comprises a light beam **14** controlling the track leveling, the sender **11** of the light beam being mounted on the track in the region of the front axle of the machine and the light beam receiver **12** being mounted in the region of the rear axle on a previously corrected track section. A light masking or intercepting stop **13** is mounted on the track in the region of the track correction. Two tensioned chords **14** and **15** are part of the reference system for controlling the track lining by the well known two-chord lining system. As more fully described and claimed in our U. S. Pat. Nos. 3,126,622, 3,164,838 and 3,314,373, for instance, among other publications, the shorter wire **15** and the longer wire **16** constitute chords in an arcuate track section and serve as reference lines for the lining. Short chord **15** extends between bogies **17** and **18**, and long chord **16** extends between bogies **17** and **21**, the bogies moving on the track with the machine and the distance between bogies **17** and **18** being fixed. The front bogie **21** is arranged in the region of the front axle and is movable independently thereof, at a fixed distance from the other bogies. The rear bogie **17** is connected to the machine frame by a telescoping spacing rod **19** so that its distance from the machine may be varied. Both chords pass a measuring bogie **12'** in the region of receiver **12** so as to determine the actual ordinate of the track by means of long chord **16** and to transpose it into the desired ordinate for the lined track by means of short chord **15**, chord probes being provided at the measuring point in the manner fully described in our U. S. Pat. No. 3,314,373.

The track lining unit **8** at the front end of the short chord **15** moves the track laterally until the actual ordinate at this point corresponds to the desired ordinate determined by the long chord **16**, at which time operation of jack **10** is stopped. At this point, the track is also lifted by operation of jack **9** until the mask **13** intercepts the light beam **14** to produce a light reference line parallel to the desired track level, which line produces a control signal at receiver **12** to interrupt operation of jack **9**. Since the track leveling and lining reference system is known, it has been described herein only sketchily.

As is shown in FIG. **2** and also known, the light beam sender **11** may be mounted in alignment with the center line of the track and emit two divergent light beams received at a pair of receivers **12, 12** each associated with a respective track rail. Alternatively, sender **11'** may be associated with each track rail. Each sender may then cooperate with a respective receiver or, in track curves, only the sender and receiver associated with the grade rail are operated.

According to the invention, the distance of the front axle or running gear supporting the machine frame **1** for mobility on the track from the track correction means **8** and the rear axle or running gear **2** is variable. In the embodiment of FIGS. **1** and **2**, this distance variation is effected by two front axles **3** and **4** longitudinally spaced from each other so that they have different distances from the track correction unit **8** and the tamping unit **7**. The foremost front axle **4** is vertically adjustable on the machine frame by means of a double-acting hydraulic jack **4'**. When moved down into engagement with the rail, the axle **4** will sufficiently lift the frame to disengage axle **3** from the rail, as shown, so that the frame rests solely on axle **4** which is retained in the adjusted vertical position by means of a mechanical stop **4''** so that the machine frame **1** solidly rests on track **5** with the front axle **4** when the same is vertically adjusted into engagement with the track while the track correction means is operated. The distance of the foremost front axle **4** from the unit **8** and rear axle **2** may be further varied by mounting the foremost axle **4** on a longitudinally extending guide rail **20** on an extension of the frame **1** for movement of the axle **4** in the direction of track elongation, as indicated by the double-headed arrow.

When the foremost axle **4** is vertically retracted out of engagement with the track, the frame rests solely on front axle **3**, which becomes the foremost axle, and whose distance from the unit **8** and rear axle **2** is less than the distance therefrom of front axle **4** which, when in engagement with the track, solely supports the frame.

The sender **11** of the light beam forming part of the reference system may be mounted on the foremost front axle **4** for longitudinal movement therewith. However, the anchor **21** of the longer chord **16** must remain fixed in relation to the other anchor of this chord so that the length of the chord remains constant, which is a condition for the two-chord lining system.

FIGS. **3** and **4** show another embodiment for the distance variation of the foremost front axle supporting the machine frame **1** for mobility on the track. In this embodiment, the front axle or running gear **3** between the foremost front axle or running gear **4** and the track correction unit **8** is vertically adjustably mounted on the machine frame into and out of engagement with the track, this adjustment being effected by double-acting jack **3'**. When the front axle **3** is retracted, the machine frame **1** is supported solely by the foremost front axle **4**.

Further distance variation between the machine frame axles is possible by providing a carrier **28** for the foremost front axle **4**, which carrier is telescopingly mounted on the front end of the machine frame **1** for extension in the direction of track elongation. As indicated by the double-headed arrows, the front axle **4** is mounted for longitudinal movement on guide rails on the carrier **28**.

In this embodiment, the tamping unit 7' consists of a double tamper of the type described in our U. S. Pat. Nos. 3,357,366 and 3,372,651 for simultaneously tamping two adjacent ties. The light beam mask 13' is mounted on two spaced-apart supports in the region of the tamping unit to compensate for an uneven level of the track at this point. The reference system for lining the track comprises only a single reference line 22 extending alongside the track at one side thereof, this reference line consisting of a light beam extending between a sender (or receiver) 23 and a receiver (or sender) 24. A light beam mask or stop 23 is laterally movable with the track into the path of the light beam 22 to control the lining in a manner similar to the level control by mask 13'. The light beam end station 24 is mounted on a bogie 26 which is mounted on the outer end of longitudinally adjustable carrier 28 so that its distance from the machine frame may be varied.

FIG. 5 shows a modification of the embodiment of FIGS. 3 and 4 but uses an independently driven front carriage 29 supporting the front end of the leveling and lining reference system. The front carriage 29 may be driven by remote control, for instance by control signals generated by lining reference light beam 22 or leveling reference light beam 30. In this manner, the front carriage 29 may be driven to so-called high points in the uncorrected track section to provide good reference points for the track correction operation in a manner well known per se. In straight track sections, the remote control of the front carriage drive makes it possible to send the front carriage a long way ahead of the track correction and tamping machine to obtain long reference lines which are advantageous in compensating for errors in the position of the end points of the reference lines. The remote control may also be used, of course, to drive the front carriage close to the machine at the end of the track work, for instance.

In the reference system of FIG. 5, reference light beam 30 extends between a receiver (or sender) 31 on the machine frame 1 and a sender (or receiver) 27 on the front carriage 29, which reference line 30 serves to control the vertical position of sender 11 of light beam 14 which serves as leveling reference. Provision of the added reference line 30 avoids faulty positioning of the end station 11 of reference line 14 because of a faulty level of the track section at this point. Thus, the accuracy of the leveling operation will be considerably increased.

We claim:

1. A mobile track correction and tamping machine, comprising

1. an elongated machine frame;
2. a front and a rear axle supporting the frame for mobility on the track,
   a. the distance between the front and rear axles providing a long wheel base, and
   b. the distance of the front axle from the rear axle being variable;
3. track tamping means mounted on the machine frame between the axles;
4. track correction means including track lifting means mounted on the machine frame between the front and rear axles,
   c. the distance of the front axle from the track correction means being varied upon variation of the distance between the axles; and
5. a reference system for the track correction.

2. The mobile track correction and tamping machine of claim 1, wherein the front axle is longitudinally adjustably mounted on the machine frame for varying the distance thereof from the track correction means and the rear axle.

3. The mobile track correction and tamping machine of claim 1, wherein the track tamping means is mounted on the machine frame closer to the rear than the front axle.

4. The mobile track correction and tamping machine of claim 3, wherein the track correction means is mounted on the machine frame immediately adjacent the track tamping means.

5. The mobile track correction and tamping machine of claim 4, wherein the track correction means is mounted between the front axle and the tamping means.

6. The mobile track correction and tamping machine of claim 1, further comprising a front and a rear bogie supporting the reference system, the bogies being movable on the track with the machine frame and being connected thereto at a variable distance.

7. A mobile track correction and tamping machine, comprising

1. an elongated machine frame;
2. a first front axle, a second front axle and a rear axle,
   a. the second front axle being longitudinally spaced from the first front axle,
   b. at least one of the front axles being vertically adjustable on the machine frame into and out of engagement with the track whereby the rear axle and a selected one of the front axles supports the frame for mobility on the track and the distance of the selected supporting front axle from the rear axle is variable, and
   c. the distance between the front and rear axles providing a long wheel base;
3. track tamping means mounted on the machine frame between the rear and front axles;
4. track correction means including track lifting means mounted on the machine frame between the rear and front axles,
   a. the distance of the selected front axle from the track correction means being varied upon selection of the first or second front axle for supporting the frame; and
5. a reference system for the track correction.

8. The mobile track correction and tamping machine of claim 7, further comprising means for mechanically retaining the vertically adjusted front axle in an adjusted vertical position.

9. The mobile track correction and tamping machine of claim 8, wherein the foremost one of the front axles is vertically adjustably mounted on the machine frame.

10. The mobile track correction and tamping machine of claim 9, wherein the vertical adjusting means includes a double-acting hydraulic jack.

11. The mobile track correction and tamping machine of claim 8, wherein the front axle closer to the track correction means is vertically adjustably mounted on the machine frame.

12. The mobile track correction and tamping machine of claim 11, wherein the vertical adjusting means includes a double-acting hydraulic jack.

13. The mobile track correction and tamping machine of claim 7, further comprising a carrier for the second front axle, said second axle being the foremost axle of the machine and said carrier being longitudinally adjustably supported on the machine frame.

14. The mobile track correction and tamping machine of claim 13, wherein the carrier is telescopically mounted on the machine frame for adjustable extension from a free end of the machine frame.

15. The mobile track correction and tamping machine of claim 13, further comprising means for mechanically retaining the longitudinally adjusted carrier in a selected position determining the distance between the foremost axle and the other axles.

16. The mobile track correction and tamping machine of claim 15, wherein the longitudinal adjusting and retaining means for the carrier comprises a hydraulic jack.

17. A mobile track working machine, comprising

1. an elongated machine frame;

2. two axles supporting the frame for mobility on the track,

   a. the distance between the axles being variable in the direction of track elongation; and

3. at least one track correction means including a track lifting means arranged along the machine frame between the axles.

18. The mobile track working machine of claim 17, wherein at least one of the axles is longitudinally adjustably mounted on the machine frame.

19. The mobile track working machine of claim 17, wherein at least one of the track correction means is a track lining means.

20. The mobile track working machine of claim 19, wherein the distance between the track lifting means and the front axle supporting the frame for mobility on the track is variable in the direction of track elongation.

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