

INSTRUCTIONS

(a) If Convention application insert "Convention"

(a) CONVENTION

AUSTRALIA

Patents Act 1990

642803

(b) Delete one

REQUEST FOR A (b) STANDARD/~~PATENT~~ PATENT

(c) Insert FULL name(s) of applicant(s)

X/We being the person(s) identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying Standard/~~Patent~~ (b) Complete Patent Specification.

X/We are (b) not an opponent or eligible person described in Sections 33-36 of the Act.

[70,71] Applicant and Nominated Person (c):

FRANZ PLASSER BAHNBAUMASCHINEN - INDUSTRIEGESELLSCHAFT m.b.H.
of (d)

(d) Insert FULL address(es) of applicant(s)

Johannesgasse 3, A-1010 Vienna, Austria

(e) Insert TITLE of invention

[54] Invention Title (e)

A TRACK MAINTENANCE MACHINE FOR THE CONTROLLED LOWERING OF A TRACK

(f) Insert Names of actual Inventors.

[72] Names of Actual Inventors (f)

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(Note: The following applies only to Convention applications)

Basic Convention Application Details

(g) Insert number, country and filing date for the/or each basic application

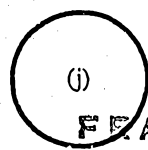
(g)	[31] Application No.	[33] Country	Country Code	[32] Date of Application
	A 218/91	Austria	AT	1 February 1991

(h) Signature of applicant(s)
(For body corporate see headnote*)

(i) Insert date of signing

(j) Corporate seal if any

Note: No legalization or other witness required



FRANZ PLASSER
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(Theurer)

14 January, 1992

(h) Signature of Applicant

(i) Date

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218/P1

AUSTRALIA

Patents Act 1990

NOTICE OF ENTITLEMENT

INSTRUCTIONS

(a) Name of person making statement.

(b) Position of that person.

(c) Name of applicant

(d) Address of applicant

(e) Delete as necessary

(f) Insert details if not covered by (i) or (ii)

(g) Delete as necessary

(ii) Delete for non-convention applications

(i) Insert DATE of signing

(j) Signature(s) of person making statement

I (a) Josef Theurer

(b) authorized officer

of (c) Franz Plasser Bahnbaumaschinen-Industriegesellschaft m.b.H.

of (d) A-1010 Vienna, Johannesgasse 3 (Austria)

State the following:-

1. The nominated person (applicant) is entitled to the grant of a patent

(c) (i) as assignee of the actual inventor(s)

~~(ii) by contract of employment of the actual inventor(s)~~

or (iii) (f)

2. The nominated person (applicant) is entitled to claim priority from the basic convention application(s).

(g) (i) as applicants of the said application(s)

~~(ii) as the assignee of the applicants of the said application(s)~~

~~(iii) with the consent of the applicants of the said application(s)~~

3. The basic convention application(s) was/were the first made in a Convention country in respect of the invention the subject of the application. (h)

Dated (i) 14 January, 1992

(i) x

JOSEF THEURER

Note: No legalization or other witness required

To: The Commissioner of Patents

PHILLIPS ORMONDE AND FITZPATRICK
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(12) PATENT ABRIDGMENT (11) Document No. AU-B-10478/92
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A TRACK MAINTENANCE MACHINE FOR THE CONTROLLED LOWERING OF A TRACK

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(56) Prior Art Documents
US 4953467
US 4928599
US 4905604

(57) A continuously advancing track maintenance machine (1)
for the controlled lowering of a track comprising

- an axle drive,
- a control system (9),
- a machine frame (4) which is mounted on undercarriages (2) and which is connected to at least one stabilizing unit (10) designed to be subjected to a vertical downward load and to be vertically displaced under the power of drives (11) and comprising vibrators for generating substantially horizontal vibrations extending transversely of the machine and
- a levelling reference system (15) comprising a reference basis and a measuring wheel-and-axle assembly (17) designed to travel along the track.

A cross-fall gauge (19,21) is arranged both in the vicinity of the stabilizing unit (10) and at the front end of the machine (1) (in the working direction). A temporary memory is provided for the delayed release of the measured value determined by the front, first cross-fall gauge (19).

(11) AU-B-10478/92
(10) 642803

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CLAIM

1. A continuously advancing track maintenance machine for the controlled lowering of a track including
 - an axle drive arranged to drive the machine,
 - a control system,
 - a machine frame which is mounted on undercarriages and which is connected to at least one stabilizing unit designed to be subjected, on actuation from the control system, to a vertical downward load and to be vertically displaced under the power of drives and comprising vibrators for generating substantially horizontal vibrations extending transversely of the machine and
 - a levelling reference system including a reference basis and a measuring wheel-and-axle assembly designed to travel along the track,wherein a cross-fall gauge is arranged both in the vicinity of the stabilizing unit and at the front end of the machine (in the working direction) and a temporary memory is provided for the delayed release of the measured value determined by the front, first cross-fall gauge.

AUSTRALIA

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COMPLETE SPECIFICATION
(ORIGINAL)

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Int. Class

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Accepted:
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Related Art:

Name of Applicant:

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Invention Title:

A TRACK MAINTENANCE MACHINE FOR THE CONTROLLED LOWERING OF A TRACK

Our Ref : 242027
POF Code: 1203/1203

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

This invention relates to a continuously advancing track maintenance machine for the controlled lowering of a track comprising

- an axle drive arranged to drive the machine,
- 5 - a control system,
- a machine frame which is mounted on undercarriages and which is connected to at least one stabilizing unit designed to be subjected, on actuation from the control system, to a vertical downward load and to be vertically displaced under the power of drives and comprising vibrators for generating substantially horizontal vibrations extending transversely of the machine and
- 10 - a levelling reference system including a reference basis and a measuring wheel-and-axle assembly designed to travel along the track.
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One such track maintenance machine, also known as a dynamic track stabilizer, is described in US-PS 4,953,467 and is used for the controlled lowering of the track after tamping to anticipate the basically unavoidable initial settlement of the track. The stabilizing units guided between the undercarriages under the machine frame surround the rail heads internally with eight flanged rollers and externally with four roller discs. Two stabilizing units with synchronized unbalances place the track in a state of horizontal vibration, the track simultaneously being subjected to a heavy load applied vertically downwards by four vertical drives supported by the machine frame.

However, this known track stabilizer is attended by the problem that, along sections of track with a cross-fall, the lowering of the track by the stabilizing units has to be manually controlled.

Now, the problem addressed by the present invention was to provide a continuously advancing track maintenance



machine of the type described at the beginning by which lowering of the track could be automatically controlled, even along sections of track with a cross-fall.

5 According to the invention, the solution to this problem is characterized in that a cross-fall gauge is arranged both in the vicinity of the stabilizing unit and at the front end of the machine (in the working direction) and a temporary memory is provided for the delayed release of the measured value determined by the front, first cross-
10 fall gauge. By virtue of this construction, it is now possible accurately to determine the position of the track - as corrected by a tamping machine - in regard to its cross-fall immediately before the beginning of work and to use the result as the set position on which to base the
15 immediately following controlled lowering of the track by the stabilizing unit. In other words, the exact mutual level of the rails present after tamping can be measured by the front cross-fall gauge in the region of the front part of the machine and can be stored in the temporary memory.
20 The stored measured value can be transmitted with local delay to the zone of action of the stabilizing unit on the second cross-fall gauge in dependence upon the working speed of the machine. This ensures that the track geometry determined in the region of the first cross-fall gauge is
25 exactly copied in the following zone of action of the stabilizing unit so that the exact track position established beforehand by a tamping machine is retained with the same accuracy.

30 In another embodiment of the track maintenance machine, the first cross-fall gauge is arranged on the front measuring wheel-and-axle assembly (in the working direction) of the levelling reference system. In this way, the exact mutual level of the two rails can be determined without in any way influencing the levelling reference
35 system and without any need for additional design effort.

In another embodiment of the invention, the control system incorporating the temporary memory is connected to a distance measuring unit. It is thus possible temporarily to store the cross fall determined, for example, at a point A until the stabilizing unit is used at the point A.

In another embodiment of the invention, a cross-fall gauge is arranged at either end of the machine and in the region of the stabilizing unit. The third cross-fall gauge - in the working direction of the machine - on the one hand provides for accurate monitoring of the lowered section of track and, on the other hand, also enables the machine to be used as required in both working directions.

Finally, another variant of the invention is characterized that the drives each arranged on one longitudinal side of the machine for applying a downward vertical load to the stabilizing units are designed to be actuated independently of one another by the control system. It is thus possible to improve the treatment or rather stabilization of switches by solving the following problem. The rails naturally differ in their lowering behavior in the region of the long sleepers. Accordingly, this results in different lowering of the two rails under the constant downward load applied by the vertical drives situated between the machine frame and the stabilizing unit. In conjunction with a new actuation of the vertical drives independently of one another, the difference in the lowering behavior of the opposite rails is automatically compensated by separately controlled, lateral downward pressures. Accordingly, there is no longer any need for manual control.

One example of embodiment of the invention is described in more detail in the following with reference to the accompanying drawings, wherein:

Figure 1 is a side elevation of a track maintenance machine according to the invention for the controlled lowering of the track comprising two cross-fall gauges.

Figure 2 is an enlarged plan view of part of the machine shown in Fig. 1.

Figure 3 is a simplified view of the basic circuitry of the two cross-fall gauges.

5 The track maintenance machine 1, also known generally as a track stabilizer, comprises an elongate machine frame 4 which, at either end, is supported on a track 3 by an undercarriage 2 and which is designed to travel in the working direction indicated by an arrow 7 under the power of an axle drive 5 and a central power supply 6. A central control system 9 incorporating a temporary memory is accommodated in one of the two driver's cabins 8.

10 Positioned centrally between the two undercarriages 2 are two stabilizing units 10 arranged one behind the other longitudinally of the machine and pivotally connected to the machine frame 4 by tie rods. Hydraulic drives 11 designed for actuation by the control system 9 are provided between the stabilizing units 10 and the machine frame 4 for applying a vertical downward load. The stabilizing units 10 engage the rail heads through four flanged wheels 12 and two roller discs 13 designed for application to the outside of the rails. Two synchronized vibrators 14 with a centrifugal force of up to 320 kN subject the track 3 to horizontal vibrations extending transversely of the longitudinal axis of the machine. The frequency of vibration is variable between 0 and 45 Hz. The downward load applied to the track 3 by the drives 11, of which there are four in all, amounts to approximately 100 kN for each drive.

15 A proportionally acting levelling reference system 15 for longitudinal levelling comprises a chord 16 stretched over each rail and extending longitudinally of the machine as its reference basis, the chord 16 being fixed at either end to vertically adjustable measuring wheel-and-axle assemblies 17 designed to travel along the track 3. By means of another measuring wheel-and-axle assembly 18

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comprising height sensors contacting the chord 16, the lowering of the track 3 is designed to be controlled and monitored by corresponding control of the downwardly applied load.

- 5 Provided at the front end of the machine 1 (in the working direction) is a cross-fall gauge 19 which is distanced from the stabilizing unit 10 longitudinally of the machine and which, in the form of an electronic precision pendulum, is fixed to the front measuring wheel-and-axle assembly 17 of the levelling reference system 15. A
- 10 distance measuring unit 20 designed to travel along one rail of the track 3 and comprising an electrical pulse generator is connected to the front undercarriage 2. A second cross-fall gauge 21, which is fixed to a vertically
- 15 adjustable measuring wheel-and-axle assembly 22 designed to travel along the track 3, is situated between the two stabilizing units 10. The rearmost measuring wheel-and-axle assembly (in the working direction) of the levelling reference system 15 is also connected to a third cross-fall
- 20 gauge 23. The cross-fall gauges 19, 21 and 23 and the distance measuring unit 20, the drives 11 and the vibrators 14 are connected to the central control system 9 which is designed for temporary storage of the cross-fall value measured by the front cross-fall gauge 19.
- 25 Situated in the vicinity of the front undercarriage 2 on each side of the machine is a transversely and vertically displaceable shoulder plough 24 by which ballast can be transported as required from the shoulder region into the region of the track. Immediately behind the shoulder
- 30 plough 24, a ballast plough 25 for working on the track is connected to the machine frame 4 for vertical displacement. The rear end of the machine 1 (in the working direction) is connected by a coupling to an auxiliary frame 26 of which the rear end is supported on the track 3 by an undercarriage 27. A monitoring measuring system 28 is provided for
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monitoring the lowering of the track to be carried out by the stabilizing units 10. A sweeping brush 29 designed to rotate about a transverse axis, in conjunction with a transverse conveyor belt 30, is fixed to the auxiliary
5 frame 26 for vertical displacement and is used to remove ballast lying on the sleepers.

The mode of operation of the machine according to the invention is described in detail in the following.

When the track stabilizer 1 enters a banked section of
10 track in which the cross fall or superelevation continuously changes, the cross level or superelevation is determined in the region of the front measuring wheel-and-axle assembly 17 by means of the cross-fall gauge 19 fixed thereto and is temporarily stored in the control system 9 until the
15 distance measuring unit 20 releases a number of pulses corresponding to its distance from the second cross-fall gauge 21. In other words, the stored measured value is available as a set value for the second cross-fall gauge 21 as soon as the second cross-fall gauge 21 has locally reached that
20 section of track in which the measured value was measured by the front cross-fall gauge 19 (see Fig. 3).

Controlled lowering of the track takes place in known manner in the region of the stabilizing units 10 in cooperation with the levelling reference system, the degree to
25 which the track is lowered being variable by a corresponding change in the speed of advance and/or the frequency of vibration and/or the vertical or basic load P. In the case of a cross fall, a corresponding measured value for the cross fall is determined by the front cross-fall gauge 19,
30 for example at a point A of the track (Fig. 2), and is temporarily stored in the control system 9 as the set value for the subsequent lowering of the track until an advance of the machine corresponding to the distance between the front cross-fall gauge 19 and the second cross-fall gauge
35 21 is recorded by the distance measuring unit 20. The

levelling reference system 15 for determining the longitudinal level is only switched on on the reference side, i.e. at the non-superelevated rail.

By means of the second cross-fall gauge 21, which is now situated at point A of the track through the continuous advance of the machine, the cross fall is continuously measured during the lowering of the track by the stabilizing units 10 and is compared as an actual value with the temporarily stored set value. If the actual value is greater than the set value, the vertical downward load P applied to the stabilizing units 10 is modified in accordance with the difference x - by harder actuation of the drives 11 in the region of the superelevated rail 31 - so that the cross fall before the use of the machine 1 is identical with the cross fall after the controlled lowering of the track by the stabilizing units 10. By the constant comparison of the cross fall in the working region, the cross fall determined by the first cross-fall gauge 19 is copied for controlled lowering of the track so that the geometry of the track remains unchanged after the use of the dynamic track stabilizer 1. The chain line 32 in Fig. 3 indicates that the difference x can also be transmitted to the drives 11 on the left-hand side of the machine if the rail 33 is superelevated around a right-hand curve.

The following third cross-fall gauge 21 enables the cross fall after use of the track stabilizer 1 to be measured, for example for establishing a record. In cases where the track stabilizer 1 does not have an auxiliary frame 26, the working direction of the machine 1 could even be reversed, in which case the third cross-fall gauge 23 shown in Figs. 1 and 2 could be used as the first cross-fall gauge. It is now possible, particularly at switches, automatically to compensate the difference in lowering behavior occurring in the region of long sleepers by corresponding different control of the drives 11 situated opposite one another transversely of the machine.

The claims defining the invention are as follows:

1. A continuously advancing track maintenance machine for the controlled lowering of a track including

- an axle drive arranged to drive the machine,
- 5 - a control system,
- a machine frame which is mounted on undercarriages and which is connected to at least one stabilizing unit designed to be subjected, on actuation from the control system, to a vertical downward load and to be
- 10 vertically displaced under the power of drives and comprising vibrators for generating substantially horizontal vibrations extending transversely of the machine and
- a levelling reference system including a reference
- 15 basis and a measuring wheel-and-axle assembly designed to travel along the track,

wherein a cross-fall gauge is arranged both in the vicinity of the stabilizing unit and at the front end of the machine (in the working direction) and a temporary

20 memory is provided for the delayed release of the measured value determined by the front, first cross-fall gauge.

2. A machine as claimed in claim 1, wherein the first cross-fall gauge is arranged on the front measuring wheel-and-axle assembly of the levelling reference system

25 in the working direction.

3. A machine as claimed in claim 1 or 2, wherein the control system incorporating the temporary memory is connected to a distance measuring unit.

4. A machine as claimed in claim 1, 2 or 3, wherein a cross-fall gauge is arranged both at either end of the machine and in the region of the stabilizing unit.

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5. A machine as claimed in any of claims 1 to 4, wherein the drives arranged on either longitudinal side of the machine for applying a vertical downwardly directed

35 load to the stabilizing units are designed for actuation independently of one another by the control system.

6. A track maintenance machine substantially as hereinbefore described with respect to what is shown in

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the accompanying drawings.

DATED: 22nd January, 1992

PHILLIPS ORMONDE & FITZPATRICK

Attorneys for:

5 FRANZ PLASSER BAHNBAUMASCHINEN - INDUSTRIEGESELLSCHAFT
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ABSTRACT

A continuously advancing track maintenance machine (1) for the controlled lowering of a track comprising

- an axle drive,
- a control system (9),
- a machine frame (4) which is mounted on undercarriages (2) and which is connected to at least one stabilizing unit (10) designed to be subjected to a vertical downward load and to be vertically displaced under the power of drives (11) and comprising vibrators for generating substantially horizontal vibrations extending transversely of the machine and
- a levelling reference system (15) comprising a reference basis and a measuring wheel-and-axle assembly (17) designed to travel along the track.

A cross-fall gauge (19,21) is arranged both in the vicinity of the stabilizing unit (10) and at the front end of the machine (1) (in the working direction). A temporary memory is provided for the delayed release of the measured value determined by the front, first cross-fall gauge (19).

(Fig. 1)

FRANZ PLASSER BAHNBAUMASCHINEN-
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Fig.1

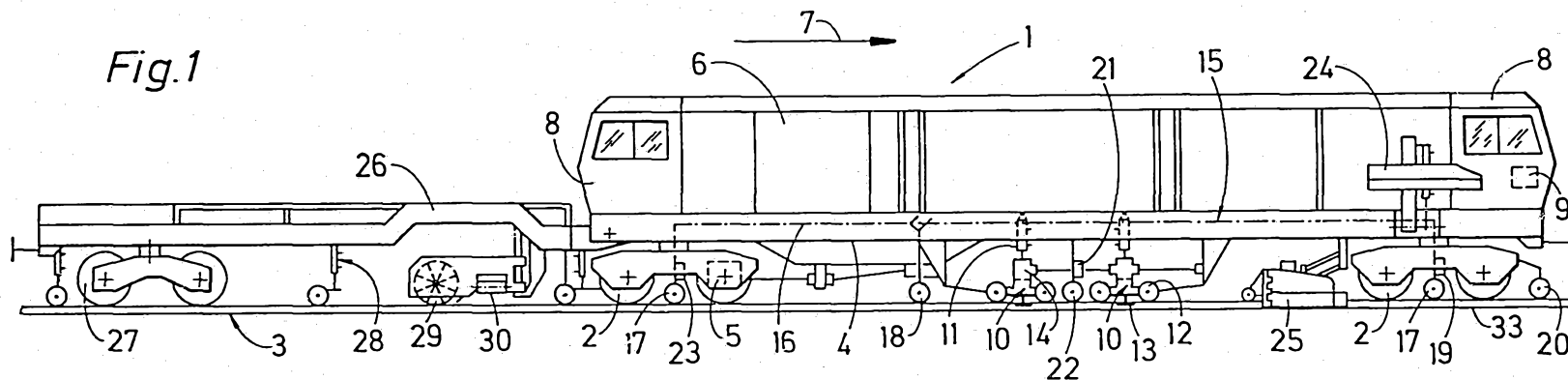


Fig. 3

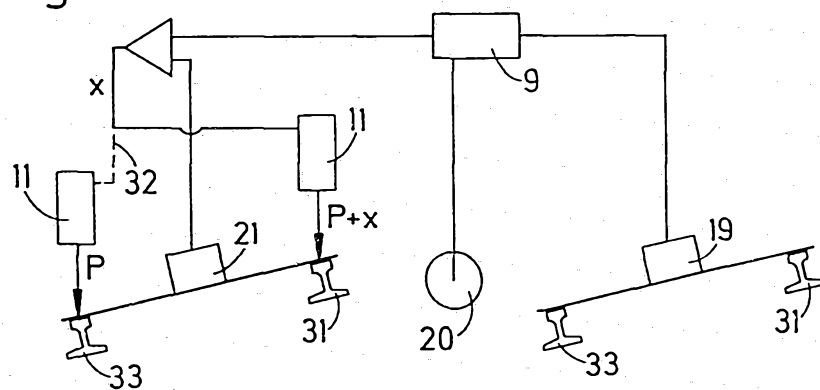


Fig. 2

