AUSTRALIA

Patents Act 1990

NOTICE OF ENTITLEMENT

I (~~We~~) Jaakko NIIRANEN

authorised by

of Nallenpolku 1, SF-70400 Kuopio FINLAND

the applicant and nominated person in respect of an application for a patent for an invention entitled Method for changing railway sleepers and equipment for applying the method

filed under Australian Application No. , state the following:

PART 1 - *Must be completed for all applications.*

The person(~~s~~) nominated for the grant of the patent

☒ is (are) the actual inventor(s)

~~or~~

☐ ~~has, for the following reasons, gained entitlement from the actual inventor(s)~~

PART 2 - *Must be completed if the application is a Convention application.*

The person(s) nominated for the grant of the patent is (are):

☒ the applicant(s) of the basic application(s) listed on the patent request form

or

☐ entitled to rely on the basic application(s) listed on the patent request form by reason of the following:

The basic application(s) listed on the request form is (are) the first application(s) made in a Convention country in respect of the invention.

PART 3 - *Must be completed if the application was made under the PCT and claims priority.*

The person(~~s~~) nominated for the grant of the patent is (~~are~~):

☒ the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT

~~or~~

☐ ~~entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following~~:

The basic application(~~s~~) listed in the declaration made under Article 8 of the PCT is (~~are~~) the first application(~~s~~) made in a Convention country in respect of the invention.

Dated this 28th day of December 19 93

Signed Status Inventor

Signatory's Name Jaakko Niiranen

F.B. RICE & CO PATENT ATTORNEYS

FBR/9-93/P1

AU9219748

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(54) Title
METHOD FOR CHANGING RAILWAY SLEEPERS AND EQUIPMENT FOR APPLYING THE METHOD

International Patent Classification(s)
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(71) Applicant(s)
JAAKKO NIIRANEN

(72) Inventor(s)
JAAKKO NIIRANEN

(74) Attorney or Agent
F B RICE & CO , 28A Montague Street, BALMAIN NSW 2041

(57) Claim

1. A method for changing railway sleepers, in this method the sleepers (2) lying transversely to the rails (1) are removed and new sleepers (3) are placed under the rails, by using a lifting device (4) the rails (1) are lifted upwards and simultaneously the rails are unfastened from the sleepers, the sleepers (2) are moved away from under the rails and new sleepers (3) are brought under the rails after which the rails are laid down and the sleepers are fastened to the rails, the railway ground is levelled by using a plough (5) which is placed below the rails (1) and which is pulled by a working machine (6) below the rails (1), characterized in that the plough (5) is used as a foundation base on which the rails rest during the work and that the plough is left under the lifted railway section when the work is interrupted so that trains can run on top of it.

2. A method according to claim 1, characterized in that the new sleepers (3) are placed under the rails (1) by using a working machine (7) equipped with supporting stands (11), this working machine rests on the supporting stands on top of the railway line and this working machine is used for holding the rails up.

.../2

5. Equipment for changing railway sleepers, this equipment consists of a lifting device (4) to be placed on top of the rails (1) for lifting the rails (1) upwards and loosening them from the sleepers (2) lying transversely under the rails, a working machine (7) for placing new sleepers under the rails, a plough (5) to be moved under the rails (1) for levelling the ground under the railway line, c h a r a c t e r i z e d in that the working machine (7) has supporting stands (11) which support it when it lies on top of the rails, and that the working machine and the plough have been arranged to support the railway line during work.

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(71)(72) Applicant and Inventor: NIIRANEN, Jaakko [FI/FI]; Nallenpolku 1, SF-70400 Kuopio (FI).

(74) Agent: PITKÄNEN, Hannu; Savilahdentie 6 A, SF-70210 Kuopio (FI).

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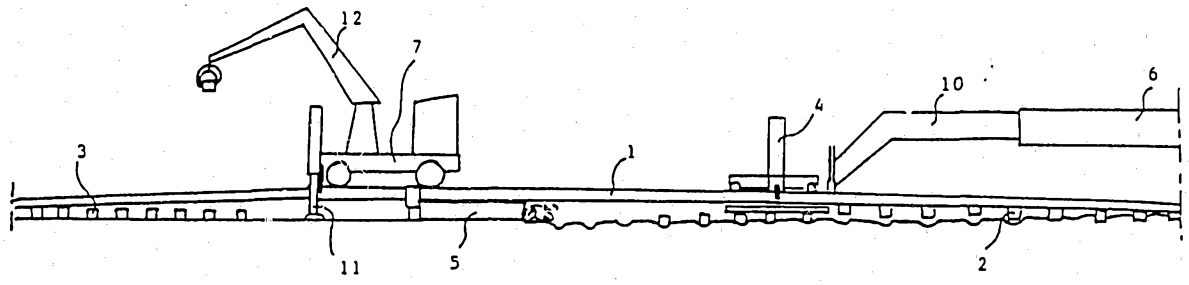
(54) Title: METHOD FOR CHANGING RAILWAY SLEEPERS AND EQUIPMENT FOR APPLYING THE METHOD



(57) Abstract

The object of the invention is a method for changing railway sleepers. In this method the sleepers (2) of the rails (1) are removed and new sleepers (3) are put in place. By using a lifting device (4) the rails (1) are lifted, at the same time they are loosened from the sleepers, the sleepers (2) are removed from under the rails and new sleepers (3) are brought under the rails and the railway ground is levelled by using a plough (5) which is placed under the rails (1) and which is pulled by the working machine (6). In addition, the object of the invention is equipment which permits the application of the method. At present, changing sleepers is slow and it requires much time to move equipment on to and off from the line. In the method, according to the invention, the plough (5) is used as a foundation base on which the rails rest during the work, and the plough can be left under the lifted railway section when the work has to be interrupted so that trains can run over it. In the equipment, according to the invention, the working machine (7) has supporting stands (11) which support it when it is lying on top of the rails, and during the work the working machine and the plough have been arranged to support the railway line.

METHOD FOR CHANGING RAILWAY SLEEPERS AND EQUIPMENT FOR APPLYING THE METHOD

The object of the invention is a method for changing railway sleepers, in this method the sleepers lying transversely under the rails are removed and new sleepers are placed under the rails. The rails are lifted upwards with the help of a lifting device and at the same time they are unfastened from the sleepers, the sleepers are removed from under the rails and new sleepers are put down under the rails. Then the rails are relaid, the new sleepers are fastened to the rails, the ground underneath is levelled by a plough which is positioned under the rails and pulled there by means of a working machine. In addition, the object of the invention is the equipment which allows the application of the above method.

Sleepers lying under the rails are usually made of wood or concrete. Wooden sleepers have to be replaced at regular intervals. To remove the sleepers, the rails first have to be unfastened from the sleepers and after that, the sleepers are pulled out from under the rails. The new sleepers are forcibly pushed under the rails either by using a machine for changing sleepers or by using a device for changing sleepers which is mounted, for example, on an excavator, and the new sleepers are fastened to the rails. Sleepers made of concrete have to be changed when basic repairs need to be done to the railway line or when track gauge is changed. When such large pieces of equipment are being used, the entire section of the railway network has to be closed to traffic, which is awkward. The present-day equipment is large-sized, complex and cumbersome. Also, even when working with small scale equipment and when devices are being moved onto a line or away from it, trains cannot run on the line and thus the equipment must be removed to let the trains run. This takes a lot of time moving the machines away from the lines and putting them back on again.

The aim of the invention is to bring forward a method for changing railway sleepers, such that, by the use of this method, disadvantages connected with present methods can be avoided. In particular, the aim of the invention is to bring forward a method, such that, by the use of this method, moving devices on to the line and off the line and changing sleepers can be done more quickly and needs less manpower than before. Besides, the aim of the invention is to bring forward such equipment which will allow for application of the method. This equipment is easy to use, efficient, can be got ready rapidly and can be quickly removed from the line.

The aim of the invention is achieved with the method and equipment characterized in the following claims.

In the method according to this invention, a plough is used as a foundation base on which rails rest during the work, and this plough can be left under the railway section under repair when work has to be interrupted so that trains can run over it. In this way, the plough does not need to be removed from under the rails until the work is completed and it does not need to be placed under the rails each time work is started. This speeds up work considerably as the actual work can be started much faster than before. During work, the ground under the line is levelled by using a plough which is pulled by means of a working machine below the rails when the rails are lifted up. When the ground has been levelled, new sleepers can be placed on an even foundation. In this way, the sleepers are always evenly against the foundation even if spaces between the sleepers have been changed.

In a favourable embodiment of the invention, new sleepers are placed under rails with the help of a working machine equipped with supporting stands. The working machine lies over the railway line and it simultaneously holds the rails up. Rails can be simply and securely lifted up and sleepers can easily be put in their place by using the same working machine. This working machine lies at a distance from a lifting device so that a chosen

length of the line can be lifted. The working machine is favourably situated behind the plough and/or partly on top of it. The plough is being pulled between the lifting device and the working machine with the help of a pulling device fastened to another working machine. The other working machine is situated at some distance from the other devices.

In the following, the invention will be explained in more detail by referring to the attached drawing in which

fig. 1 shows a side view of the equipment for applying the method according to the invention

fig. 2 shows a top view of the equipment according to fig. 1, and

fig. 3 shows a back view of an embodiment of a lifting device of the equipment according to the invention.

In the embodiment shown in figures 1 and 2, the equipment consists of a lifting device 4, plough 5 and working machines 6 and 7. The lifting device 4 has been connected to a boom 10 of the working machine 6. The lifting device has been placed above rails 1 so that it will be on top of sleepers 2. The working machine 6 has been placed above the rails at such a distance from the lifting device that it does not press the rails at the position of the lifting device. The working machine 7, which in this embodiment is a railway rig, has been placed on top of the rails at a distance behind the lifting device. The working machine is fastened to the rails and it has supporting stands 11, with the help of which it can lift the rails to the desired height. Besides, a derrick 12 has been placed on the working machine to slide new sleepers 3 under the rails.

A plough 5 has been placed under the rails so that the working machine 7 is behind it and partly on top of it. The plough has been connected to the working machine 6 farthest to the front by using a chain or cable which acts as a pulling device 9. The chain has been taken under the lifting device to the boom and from there to the working machine. The plough has been fastened movably to the rails in a previously known way and in the back part it has

supports for keeping the rails at the right height and the plough straight. The plough has been made of strong materials and when work has to be interrupted it can be left under the lifted railway section where it acts as a foundation base and it need not be removed from under the line at the end of each working stage. When a new shift of work begins, the plough is immediately ready for work.

The lifting device shown in figure 3 consists of a frame 13 and to the frame, cylinders 14 have been fastened and to the sides of the frame arresters 15 have been reversibly fastened and they have been fitted with gripping points.

When railway sleepers are changed using the method according to the invention, a lifting device 4 is placed on the selected spot of the line. The lower part of the lifting device is placed against sleepers 2 and the arresters of the lifting device are turned to a position shown in figure 3 so that their gripping points are against rails 1. By using hydraulic cylinders 14, the arresters and the rails fastened to them are lifted upwards. The lower part of the lifting device is against railway sleepers so that spikes and foundation plates are loosened along with the rails when they are pulled upwards and the rails are quickly loosened from the sleepers. After this, the old railway sleeper is pulled aside. The lifting device is moved forward and the work is repeated.

The working machine 7 of the railway rig 7 has been placed on top of the rails at a distance from the lifting device and with the help of its supporting stands the rails are also he. up. By using the derrick placed on the rig, new railway sleepers 3 are moved under the rails where fastening of the sleepers takes place, for instance, manually. There are no sleepers at this point of the railway section so that sleepers can be slid unhindered under the rails from the side.

The plough 5 has been placed in front of the railway rig and partly under it. The uneven ground under the line is levelled and lowered

by using the plough which is pulled by using the pulling device 9 fastened to the working machine 6. The plough vibrates at a high-frequency which is an advantage to overcome friction. When the plough has been pulled to the lifting device the working machine 6 and the lifting device are moved forward and the operations are repeated. Also the railway rig is moved forward as the work progresses. As the plough moves forward, banks will form on the edges of the moldboards, and the sleepers are placed between these banks under the railway line.

The equipment according to the invention has the great advantage that the devices it consists of are separate, relatively small-sized and it is easy to lift them off the line or back on to the line as time demands. They need not be transferred to a sideline or taken to the nearest station when the work is not in progress.

The invention will not be limited to the described favourable embodiment but it may vary within the frame of the innovative idea formed by the claims.

CLAIMS

1. A method for changing railway sleepers, in this method the sleepers (2) lying transversely to the rails (1) are removed and new sleepers (3) are placed under the rails, by using a lifting device (4) the rails (1) are lifted upwards and simultaneously the rails are unfastened from the sleepers, the sleepers (2) are moved away from under the rails and new sleepers (3) are brought under the rails after which the rails are laid down and the sleepers are fastened to the rails, the railway ground is levelled by using a plough (5) which is placed below the rails (1) and which is pulled by a working machine (6) below the rails (1), characterized in that the plough (5) is used as a foundation base on which the rails rest during the work and that the plough is left under the lifted railway section when the work is interrupted so that trains can run on top of it.

2. A method according to claim 1, characterized in that the new sleepers (3) are placed under the rails (1) by using a working machine (7) equipped with supporting stands (11), this working machine rests on the supporting stands on top of the railway line and this working machine is used for holding the rails up.

3. A method according to claim 2, characterized in that the working machine (7) has been placed behind the plough (5) and/or partly on top of it and that the plough is pulled between the working machine (7) and the lifting device (4) by using a pulling device (9) fastened to the working machine (6) which lies at some distance from the other working machines.

4. A method according to one of the claims 1-3, characterized in that the rails (1) are gripped by the arresters (15) of the lifting device (4) and the arresters are moved upwards by using a power device (14) when the lifting device is against the sleepers (2) so that the rails are loosened from the sleepers.

5. Equipment for changing railway sleepers, this equipment consists of a lifting device (4) to be placed on top of the rails (1) for lifting the rails (1) upwards and loosening them from the sleepers (2) lying transversely under the rails, a working machine (7) for placing new sleepers under the rails, a plough (5) to be moved under the rails (1) for levelling the ground under the railway line, c h a r a c t e r i z e d in that the working machine (7) has supporting stands (11) which support it when it lies on top of the rails, and that the working machine and the plough have been arranged to support the railway line during work.

6. Equipment according to claim 5, c h a r a c t e r i z e d in that the working machine (7) has been placed behind the plough (5) and/or partly on top of it.

7. Equipment according to claim 5 or claim 6, this equipment consists of a working machine (6) for pulling the plough by using a pulling device (9), c h a r a c t e r i z e d in that the working machine (6) has been placed at a distance from the lifting device (4) and connected to it with a boom (10).

8. Equipment according to claim 7, c h a r a c t e r i z e d in that the pulling device (9) of the plough (5) has been placed under the lifting device (4) below the rails by means of a boom (10).

9. Equipment according to one of the claims 5-8, c h a r a c t e r - i z e d in that the lifting device (4) has arresters (15) fastened reversibly to the sides of the device and a power device (14) for moving the arresters vertically.

19748/92

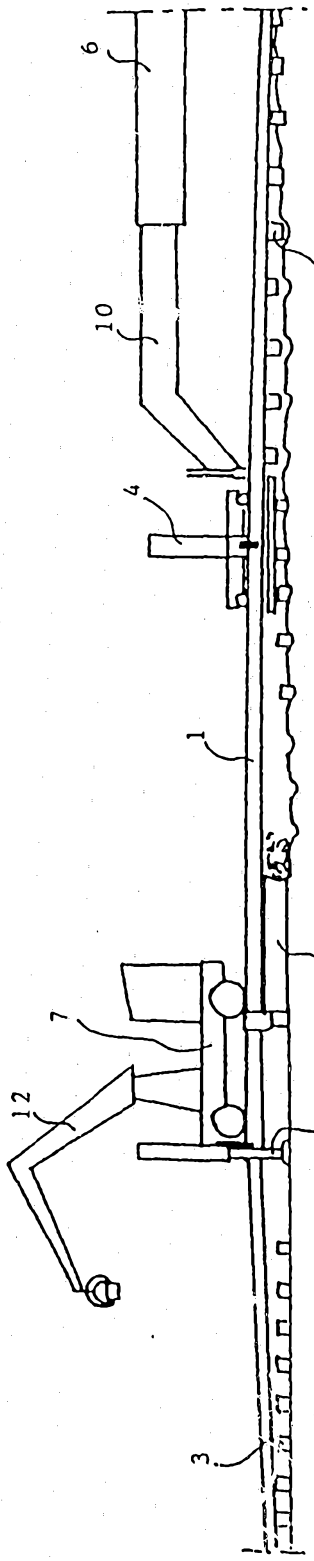


Fig.1

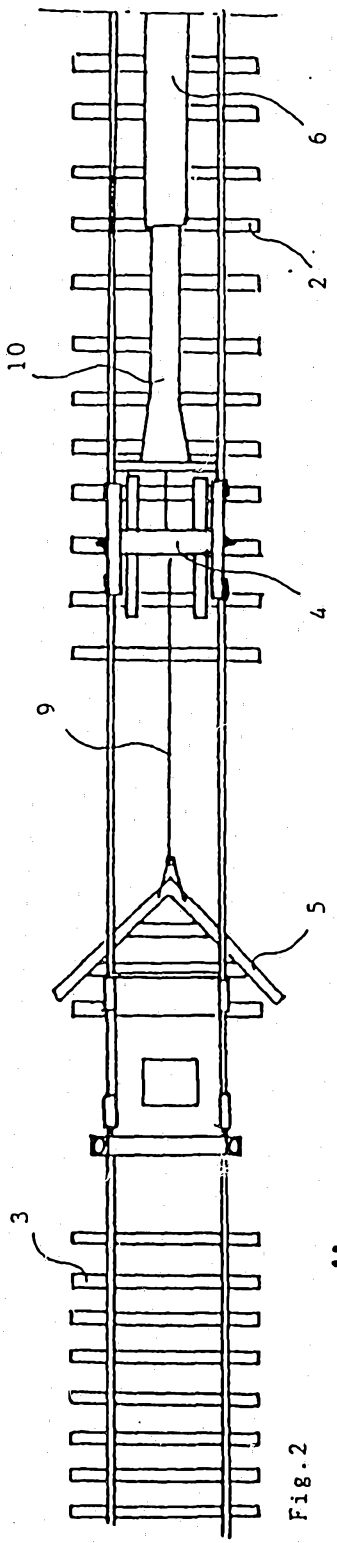


Fig.2

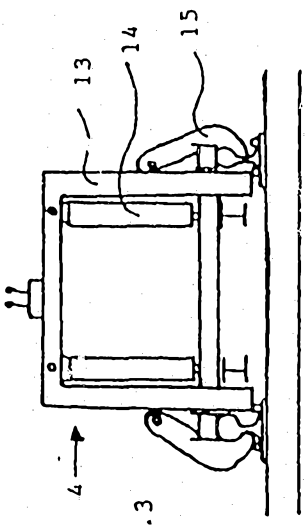


Fig.3

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 92/00197

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: E01B 29/10

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	E01B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	CH, A5, 600047 (MATISA MATERIEL INDUSTRIEL S.A.) 15 June 1978, see the whole document --	1-9
A	DE, C2, 2624212 (FRANZ PLASSER BAHNBAUMASCHINEN-INDUSTRIEGESELLSCHAFT MBH) 21 October 1982, see the whole document --	1-9

* Special categories of cited documents:[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
5th October 1992	07 -10- 1992
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Åke T Larsson

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/FI 92/00197

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 28/08/92
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
CH-A5- 600047	78-06-15	AT-B-	343163	78-05-10
		CA-A-	1062547	79-09-18
		DE-A-C-	2627845	77-09-08
		FR-A-B-	2343084	77-09-30
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		JP-C-	1261486	85-04-25
		JP-A-	52053311	77-04-28
		JP-B-	59037361	84-09-10
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