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(54) **Detection device of a short-circuit bridge**

(57) The invention relates to a device for detecting a short-circuit bridge between or across the rails of a railway section, comprising a first arm, which can be brought into electrical contact with a first rail; a second arm, which can be brought into electrical contact with the other rail; an electrical power source, as well as detection means for detecting and monitoring, in use, the short-circuit resistance of the short-circuit bridge realised by the two arms and between the two rails.

According to the invention the short-circuit lance or

device for detecting a short-circuit bridge between or across the rails of a railway section is characterised in that each arm is at least made up of two arm members extending parallel to each other, which arm members can each be brought into electrical contact with one and the same rail. In this way the short-circuit bridge is realised at several points between the two rails, so that, if for some reason the electrical contact between one or more arm members should be lost, this will not result in on-coming trains being granted access to the track section that was initially blocked by the dropped-out relay.

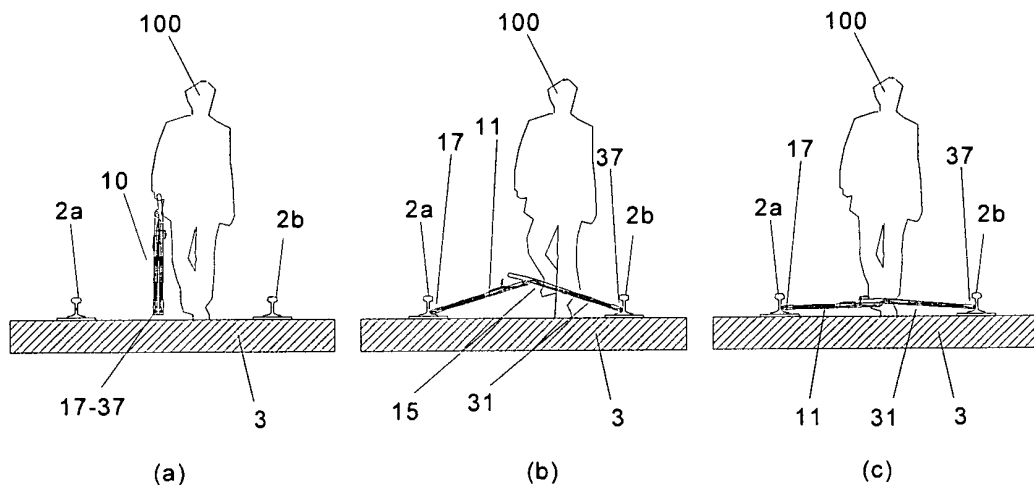


Fig. 4

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Description

[0001] The invention relates to a device for detecting a short-circuit bridge between or across the rails of a railway section, comprising a first arm, which can be brought into electrical contact with a first rail; a second arm, which can be brought into electrical contact with the other rail; an electrical power source, as well as detection means for detecting and monitoring, in use, the short-circuit resistance of the short-circuit bridge realised by the two arms and between the two rails.

[0002] As is generally known, the Dutch railway network is divided into several sections, also referred to as track sections. The successive track sections are electrically insulated from each other. For reasons of track safety it is possible to determine by means of a so-called track circuit whether a train is present in the track section in question.

[0003] For each section the track circuit forming part of the railway safety system consists of an AC voltage source connected to the rails on one side of the section and a track relay connected to rails on the other side of the section. The moment a train enters the track section in question, the axles of the train cause a short-circuit with the AC voltage source across the two rails, as a result of which less current will flow to the track relay, causing it to drop out.

[0004] As a result of said dropping out of the track relay, the track signal associated with the track section in question will change to red, indicating to oncoming trains that the railway track selection ahead of them is not clear. Moreover, as a consequence of the track signal changing to the red, the railway track safety system will automatically stop any trains that enter the track section yet.

[0005] The moment work is to be carried out in a specific track section, it is desirable and usual to install a short-circuit bridge between the rails of the section in question, thus simulating the presence of a train in said track section. As a result, the track relay will drop out and the track signal in question will change to red.

[0006] This short-circuit bridge is realised by means of a so-called short-circuit lance as described in the introductory part of the main claim and as disclosed in, for example, Dutch patent publication No. 1000713. The known short-circuit lance comprises two arms which are each brought into electrical contact with one of the two rails. The short-circuit realised by means of the short-circuit lance simulates the presence of a train, causing the track relay to drop out. As a result, the railway safety system "thinks" that a train is present in the track section in question and thus bars trains from entering said section by changing all the signals of tracks leading towards said section to red.

[0007] In a simple embodiment of the known short-circuit lance, a check needs to be made before work is started to verify whether the track relay in question has indeed dropped out. In order to be absolutely certain it is necessary in practice to walk to the signpost in question to

check whether the installation of the short-circuit bridge with the short-circuit lance has indeed resulting in the track signal changing to red.

[0008] In addition to that there is a chance that for some reason the short-circuit resistance realised between the two rails will change while work is being carried out and run up so high that the track relay energises again. It stands to reason that this is an undesirable situation, because oncoming trains can now enter the initially protected track section.

[0009] A solution to the above problem is proposed in Dutch patent application No. 1000713. The short-circuit lance described in said publication comprises two arms, which can be brought into electrical contact with each of the rails, and which furthermore comprises a power source and as well as detection means, which, in use, detect and monitor the short-circuit resistance of the short-circuit bridge realised by the two arms and between the two rails.

[0010] To ensure a reliable operation, the short-circuit lance according to NL-1000713 must make a good electrical contact with the two rails, which means that the two arms must be capable of penetrating through rust and dirt that may be present on the sides of the rails. To that end it is proposed in another Dutch patent publication No. 1001121 to provide the contact ends of the two arms with two electrically separated contacts, at least one electrical contact of which is arranged in a circular arc around the other electrical contact.

[0011] The drawback remains, however, that the known short-circuit lance is clamped between the rails only in two points, and that there is a chance that for some reason the electrical contact between one arm or both arms is broken in the course of time, so that the short-circuit effect is lost without this being noticed, causing the track relay to energise again.

[0012] The object of the invention is to provide a solution to the above problem, and according to the invention the short-circuit lance or device for detecting a short-circuit bridge between or across the rails of a railway section is characterised in that each arm is at least made up of two arm members extending parallel to each other, which arm members can each be brought into electrical contact with one and the same rail. In this way the short-circuit bridge is realised at several points between the two rails, so that, if for some reason the electrical contact between one or more arm members should be lost, this will not result in oncoming trains being granted access to the track section that was initially blocked by the dropped-out relay.

[0013] To maintain the electrical contact between the arm members, each arm member can telescope against spring force.

[0014] More specifically, each arm member is provided with a contact head to be placed into abutment with a rail, the contact surface of which is provided with a material that has been applied by explosion welding. This ensures a good electrical contact between the arm sec-

tions and the rail.

[0015] According to a functional embodiment of the detection device according to the invention, the two arms are pivotally interconnected. One the one hand this makes it possible to realise a compact construction, which, in addition, is quite easy to handle during transport and further handling.

[0016] To obtain a good electrical clamping contact between the two rails, the length of the two arms at rest is greater than the width between the rails.

[0017] To clamp down the detection device according to the invention between the two rails, the detection device is according to the invention provided with a pressure surface near the pivot point, for example for a user's foot. The two pivoting arms enable operating staff to clamp the detection device in question between the two rails by foot, which is done by placing a foot on the detection device at the pivot point and pressing it down.

[0018] Operators thus need not bend down to clamp the short-circuit lance in question between the two rails, as is necessary with short-circuit lances according to the prior art, which bent-down position makes it difficult for them to have a good view of the track section in question, and which constitutes a hazard, therefore. Since the operating staff can press the pivoting short-circuit lance between the two rails by foot, the operator in question will retain a complete view of the track section, which is safer both for himself and for bystanders.

[0019] In a more functional embodiment of the detection device according to the invention, the detection means are provided with wireless communication means for wirelessly transmitting information regarding (the status of) the short-circuit resistance of the short-circuit bridge that has been realised. In this way it is no longer necessary to visit the track section in question to check the status of the short-circuit resistance.

[0020] To make the detection device according to the invention more easily manageable, the device is according to the invention provided with at least one handle.

[0021] Furthermore, a more functional embodiment can be realised if each arm is made up of at least three arm members, which can be brought into electrical contact with one and the same rail.

[0022] According to another functional embodiment, each arm member may furthermore be configured as a flexible member, in particular as a cable provided with a rail ground terminal. This makes it possible to fit and connect the device in a track section in a simpler and more flexible manner.

[0023] The invention will now be explained in more detail with reference to a drawing, in which:

Figures 1 a and 1b are plan views of a track section protected by a railway safety system;
Figure 2 shows a detection device according to the prior art;
Figures 3a and 3b show the two parts of embodiment of a detection device according to the invention;

Figures 4a-4c are views showing ways of handling a detection device according to the invention.

[0024] For a better understanding of the invention, corresponding parts will be indicated by identical reference numerals in the description of the figures below.

[0025] Figure 1 shows a railway 1 built up of successive track sections 1_{-1} - 1_0 - 1_{+1} etc. The track, which comprises several track sections, is built up of rails 2a-2b, which are fixed to sleepers 3. The successive track sections are separated from each other by means of insulating connecting bridges 4 provided in one of the rails 2a-2b or, as shown in the figure, in both rails.

[0026] Each track section 1_{-1} - 1_0 - 1_{+1} is provided with a track circuit, by means of which the presence of a train in the section in question can be detected. To that end the track circuit of each track section is built up of an AC voltage source 5, which is connected to each rail 2a, 2b by means of connections 5a, 5b, respectively. On the other side of the track section in question a dropout or track relay 6 is provided, which is likewise electrically connected to the two rails 2a, 2b of the section in question by means of connections 6a, 6b, respectively.

[0027] In the situation shown in figure 1a, no train is present in the track section 1_0 , which means that the AC voltage applied across the two rails 2a-2b (by the AC voltage source 5) keeps the (magnetic) relay 6 energised and open. This situation means that the track signals associated with the track section in question are green and that the track safety system allows trains to enter said track section 1_0 .

[0028] Figure 1b shows the situation in which a train 7 enters the track section 1_0 from the left. The axles 7a of the train create a short-circuit between the two rails 2a-2b, causing current to flow from the AC voltage source 5, via the connection 5a, the rail 2a, the axles 7a and via the other rail 2b and the connection 5b back to the AC voltage source. As a result, less current will flow to the track relay 6, causing it to drop out. This situation is shown in figure 1 b.

[0029] Said dropping out of the track relay 6 resulting from the short-circuit created across the two rails 2a-2b will cause the track signals associated with the track section 1_0 in question to change to red. Turning the track signals to red means that the track section in question is protected and for the time being inaccessible to subsequently arriving trains.

[0030] When work is being carried out in the track section in question, such short-circuiting of the track section 1_0 by a passing train 7 can also be simulated by a "simulation train", using a short-circuit lance, a prior art embodiment of which is shown in figure 2. The prior art short-circuit lance 10 is built up of a housing 10a, to which two arms 11-31 are connected, whose contact heads 17-37 can be brought into electrical contact with the respective rails 2a-2b. The two arms 11-31 can be moved apart by means of a lever 10b so as to effect a good clamping engagement and thus a good electrical contact between

the contact heads 17-37 and the two rails 2a-2b. The short-circuit thus realised between the two rails 2a-2b can be detected or monitored by means of suitable detection means 15, in this embodiment in the form of a separate unit, which is connected to each contact head 17-37 by means of connections 15a and 15b, respectively.

[0031] The short-circuit lance 10 as shown in figure 2 has a number of drawbacks, the most important being the single contact between the two arms 11-31 and the rails 2a-2b. Apart from the fact that the electrical contact between the two arms 11-31 and the respective rails 2a-2b cannot be adequately realised and ensured at all times, the prior art short-circuit lance has another significant drawback in use.

[0032] Upon installation of the short-circuit lance 10 between the two rails 2a-2b, the arms 11-31 need to be moved apart by means of the lever 10b. Operating staff must to that end operate the lever 10b in a bent-over position in order to move the two arms 11-31 apart and into contact with the two rails 2a-2b. The user's bent-over position leads to a hazardous situation, since the person in question does not have a good view of the track section, which at that point is not protected and secured yet.

[0033] Figures 3a and 3b and in particular 4a-4c show an improved embodiment of a short-circuit lance according to the invention. Identical parts are indicated by the same reference numerals in these figures, too.

[0034] The short-circuit lance 10 is built up of two arms 11-31, which are pivotally interconnected near the position indicated at 13. The pivot axis 13 makes it possible to fold down the device 10 after use, so that the two arm members 11-31 will extend parallel to each other. This construction makes the device easier to handle and transport, the latter for example by means of the handles 14a-14a' or the handle 14b or 14c as shown in figure 4a.

[0035] As figures 3a and 3b clearly show, each arm 11-31 is built up of several (three in this embodiment) arm members 16a-16c and 36a-36c, respectively, which can each be individually brought into electrical contact with one of the two rails 2a and 2b, respectively, by means of contact heads 17a-17c and 37a-37c, respectively. The use of several arm members, three arm members 16a-16c, 36a-36c for each arm 11, 31, respectively, makes it possible to realise a more reliable short-circuit between the two rails 2a-2b. By realising electrical contact between each arm 11-31 and the rails 2a-2b at several positions, it can be ensured in a more adequate manner that the short-circuit will be maintained, thus obtaining an improved detection and monitoring of the short-circuit resistance that has been realised in this manner.

[0036] The reliability of the device obtained by realising an electrical contact at several positions is additionally ensured by the fact that the circuitry is internally separated from each other in several spaces formed by the various arm members 16a-16c, 36a-36c, respectively. Unintentional internal short-circuiting between the circuitry is not possible, whilst the cable work is furthermore

fully insulated.

[0037] The arm members 16a-16c and 36a-36c, respectively, are telescopic and can be adjusted against the action of a return force, in this case spring force provided by the springs 19a-19c and 39a-39c, respectively. In this way the device 10, and in particular the arm members 16a-16 and 36a-36c, respectively, can be clamped between the two rails 2a-2b under pre-tension. The arm members 16a-16 and 36a-36c, respectively, are to that end provided with projections 21a-21c and 41a-41c, respectively, which are slidably accommodated in slots 20a-20c and 40a-40c, respectively, formed in the housing 11b-31 b of the arms 11-31. In this way the maximum amount of travel of the arm members against the spring force of the springs 19a-19c and 39a-39c is limited.

[0038] To effect a reliable electrical contact between the arm members 16a-16 and 36a-36c, respectively, and the rails 2a-2b, each of the contact heads 17a-17c and 37a-37c, respectively, has a contact surface 18a-18c, 38a-38c, respectively, to which a contact-enhancing material has been applied by explosion welding (also called "cladding"). Said electrical contact-enhancing material ensures a correct detection of the short-circuit resistance by the device.

[0039] The device 10 is furthermore provided with suitable means 15-35, which function as detection means for detecting and monitoring the short-circuit resistance realised by the arm members 16a-16 and 36a-36c, respectively, and the rails 2a-2b.

[0040] The multiple contacts between the rails prevent the connection between the arms 11-31 and the rails 2a-2b from being unintentionally broken. The use of multipoint detection further leads to a more reliable device and thus a higher level of safety for the operators 100 in the protected track section.

[0041] The detection means 15-35 may optionally be provided with a GSM unit 35a, so that status information of the detected short-circuit resistance can be collected and be transmitted to a central operating unit or a responsible person via a wireless telecommunication link. Said status information may inter alia comprise information about the position and identity of the detection device, but above all information concerning the state of the detection device, such as the current value of the measured short-circuit resistance.

[0042] The status information may also include the current condition of the battery that forms part of the detection device and indicate whether the measured short-circuit resistance reaches or has reached an undesirable, i.e. unsafe, value. In the latter case this might lead to the track signals undesirably changing to green without this being directly noticeable, so that the protected track section is no longer barred to regular trains rushing towards said track section.

[0043] Furthermore, current information regarding the status of the short-circuit resistance between the two rails 2a-2b may be retrieved by remote control, for example by means of an SMS message that is sent to the GSM

unit 35a.

[0044] In addition to that, the detection means may be provided with remote-controlled switch (wireless or wired) for making or breaking the short-circuit between the rails 2a-2b. This makes it possible to install the detection device (short-circuit lance) semi-permanently in a track section and activate it by remote control depending on whether or not track work is being carried out. This prevents operators from having to cover unnecessarily long distances for manually activating and deactivating the short-circuit bridge of the detection device (short-circuit lance).

[0045] Figures 4a-4c show the installation steps of a short-circuit lance 10 according to the invention. The pivot construction 13 makes the device 2 easy to handle and to transport in folded condition (see figure 4a). The arms 11-31 are pivoted apart upon installation of the short-circuit lance, moving the contact heads 17-37 into abutment with the rails 2a-2b. As shown in figure 3b, the arm member 31 is provided with a contact plate 33, by means of which the maintenance worker 100 in question can move the device 10 down with his foot, effectively clamping it between the two rails 2a-2b.

[0046] As a result of the maintenance worker moving down his foot on the contact plate 33 in the centre of the short-circuit lance, the contact heads 17-37 move along the rails in an upwardly twisting path. As a result of said twisting motion, the spring-loaded contact heads scratch into the rail (thereby removing rust and dirt), thus realising a better electrical contact.

[0047] It is further noted in this context that in a position of rest and in the folded-down position shown in figure 4a, the joint length of the arms 11 and 31 is greater than the width between the two rails 2a-2b. When the arms 11-31 are pressed down by foot, the arm members 16a-16 and 36a-36c, respectively, will telescope down against the spring force of the springs 19a-19c and 39a-39c, respectively, and thus be clamped between the two rails 2a-2b.

[0048] This installation method has two advantages: on the one hand a proper retainment of the arms 11-31 between the rails 2a-2b is realised, so that a good and permanent electrical contact between the arm members 16a-16 and 36a-36c, respectively, and the rails 2a-2b is maintained. This latter aspect has a positive effect on the reliability and functionality of the short-circuit lance 10 according to the invention. On the other hand, since the arm members 16a-16 and 36a-36c, respectively, can be telescoped down by foot, a safer working situation is created. Unlike the short-circuit lance shown in figure 1, the person involved need not clamp the two arms 11-31 between the two rails 2a-2b in a bent-over position, using the lever 10b.

[0049] The person 100 in question can clamp the short-circuit lance 10 according to the invention between the rails 2a-2b by foot from a standing position, and will at all times retain a good view of the track section in which the work is to be carried out and which is not protected

against oncoming trains yet at the moment of installing the short-circuit lance 10.

[0050] In another functional embodiment, each member may furthermore be configured as a flexible member, in particular as a cable provided with a rail ground terminal. This enables a simpler and more flexible installation and connection of the device in a track section.

[0051] It will be apparent that the short-circuit lance as described herein provides a more versatile but above all more reliable and especially safer embodiment, which significantly enhances the level of safety and reliability of the work being carried out on the railway.

15 Claims

1. A device for detecting a short-circuit bridge between or across the rails of a railway section, comprising a first arm, which can be brought into electrical contact with a first rail;
a second arm, which can be brought into electrical contact with the other rail;
an electrical power source, as well as detection means for detecting and monitoring, in use, the short-circuit resistance of the short-circuit bridge realised by the two arms and between the two rails, **characterised in that** each arm is at least made up of two arm members extending parallel to each other, which arm members can each be brought into electrical contact with one and the same rail.
2. A detection device according to claim 1, **characterised in that** each arm member can telescope against spring force.
3. A detection device according to claim 1 or 2, **characterised in that** each arm member is provided with a contact head to be placed into abutment with a rail, the contact surface of which is provided with a material that has been applied by explosion welding.
4. A detection device according to any one or more of the preceding claims, **characterised in that** the two arms are pivotally interconnected.
5. A detection device according to claim 4, **characterised in that** the length of the two arms at rest is greater than the width between the rails.
6. A detection device according to claim 4 or 5, **characterised in that** the detection device is provided with a pressure surface near the pivot point, for example for a user's foot.
7. A detection device according to any one or more of the preceding claims, **characterised in that** the detection means are provided with wireless communication means for wirelessly transmitting information

regarding (the status of) the short-circuit resistance of the short-circuit bridge that has been realised.

8. A detection device according to any one or more of the preceding claims , **characterised in that** the device is provided with at least one handle. 5
9. A detection device according to any one or more of the preceding claims , **characterised in that** each arm is made up of at least three arm members, which can be brought into electrical contact with one and the same rail. 10
10. A detection device according to any one or more of the preceding claims , **characterised in that** each arm member is configured as a flexible member, in particular as a cable provided with a rail ground terminal. 15

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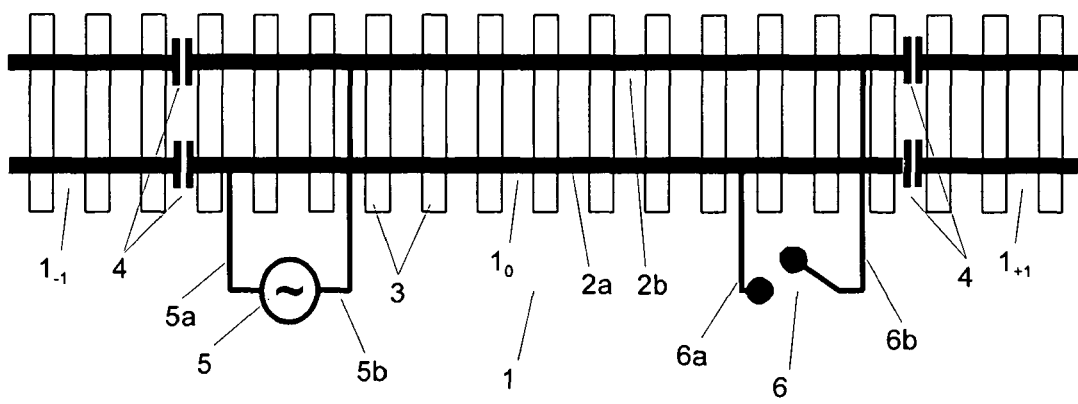


Fig. 1a

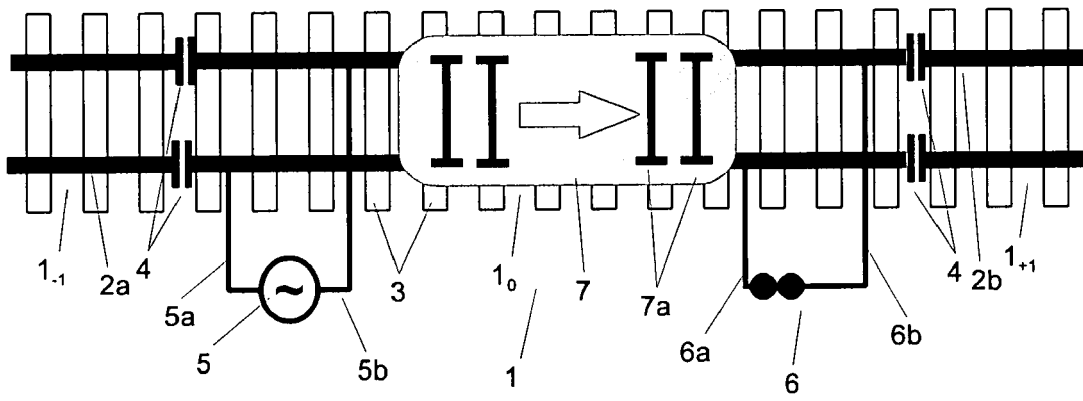


Fig. 1b

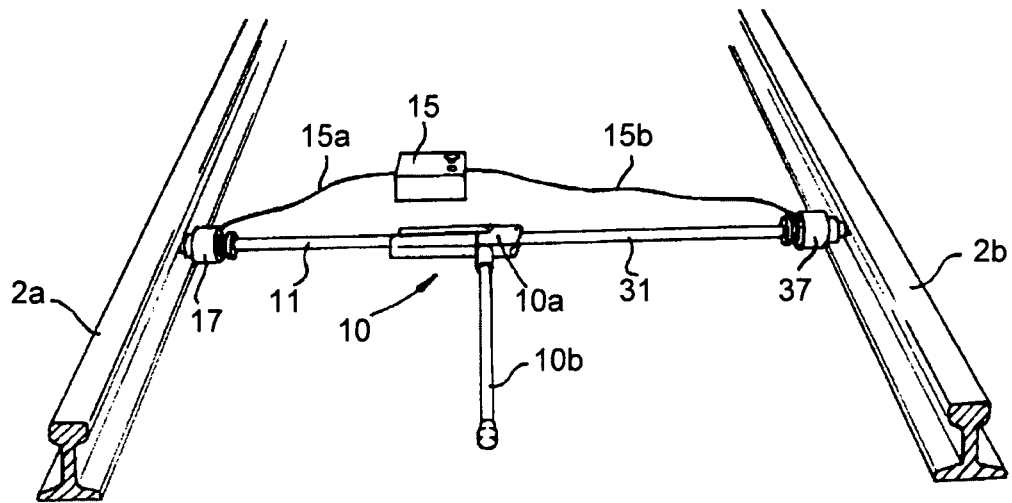


Fig. 2
(state of the art)

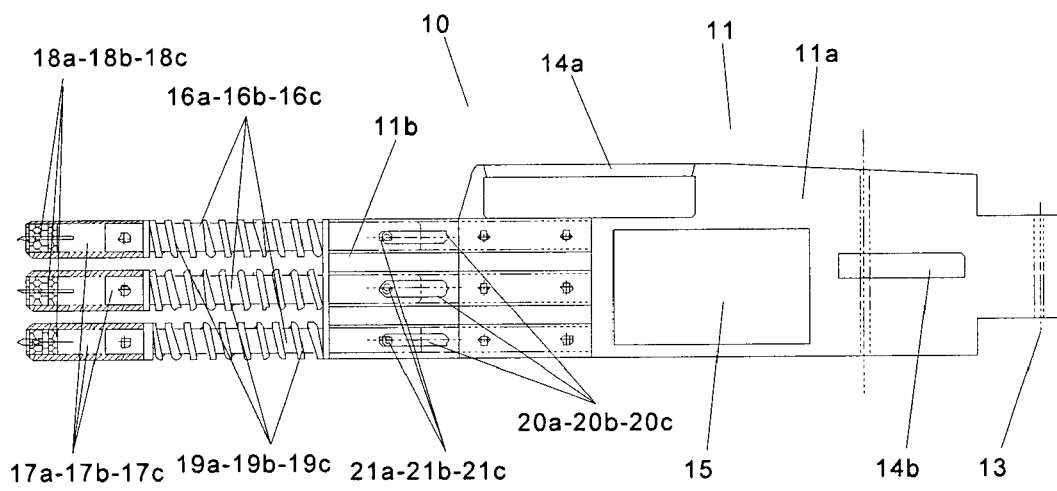


Fig. 3a

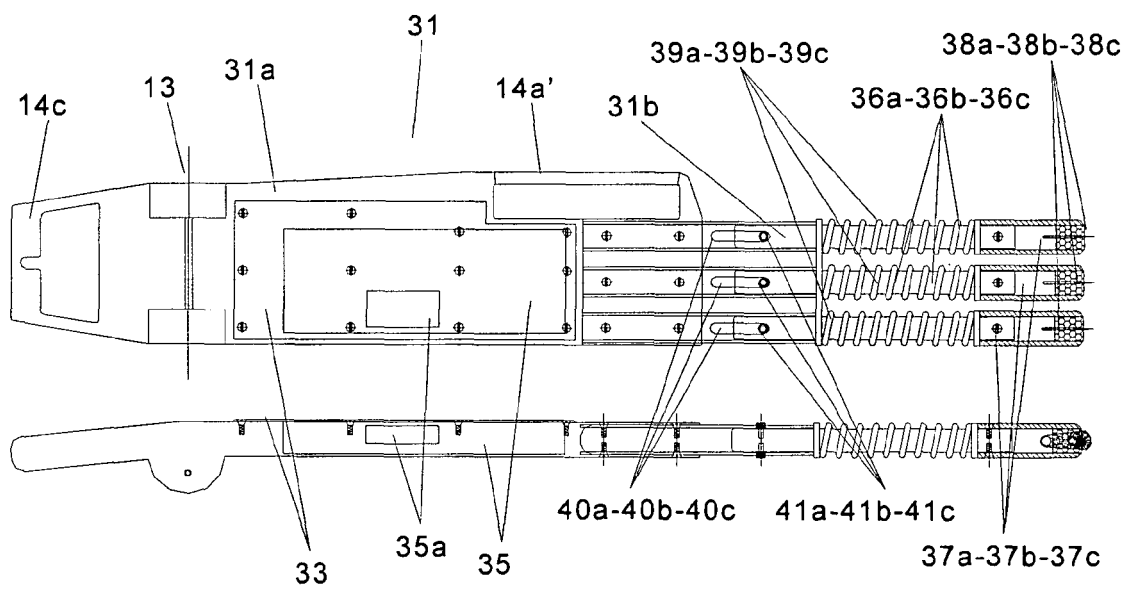


Fig. 3b

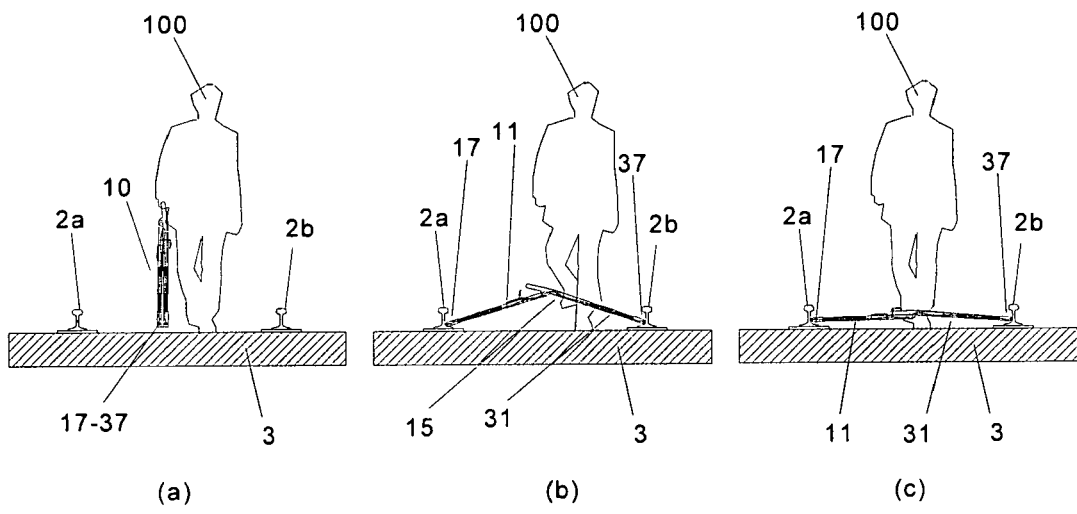


Fig. 4



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,Y	WO 97/09193 A (RAILPRO BV [NL]; TIECKEN JACQUES [NL]) 13 March 1997 (1997-03-13) * figure 1 *	1-10	INV. B61L23/06 H01R13/24
Y	US 2006/281359 A1 (NORDIN RONALD A [US]) 14 December 2006 (2006-12-14) * paragraph [0043]; figure 5a *	1-10	ADD. H01R4/26 H01R4/64 H01R4/66 H01R31/08
Y	DE 405 128 C (SIEMENS SCHUCKERTWERKE GMBH) 30 October 1924 (1924-10-30) * figures 1,2 *	1	
Y	GB 2 391 724 A (HEWLETT PACKARD DEVELOPMENT CO [US]) 11 February 2004 (2004-02-11) * figures 4b,4d,4e,4f *	1	
Y	US 2 275 367 A (SLOAN JAMES ROBERT) 3 March 1942 (1942-03-03) * figure 1 *	1	
D,A	WO 97/02169 A (RAILBEDRIJVEN B V [NL]; DOMMELEN FRANCISCUS ANTONIUS B [NL]) 23 January 1997 (1997-01-23) * abstract *	1-10	TECHNICAL FIELDS SEARCHED (IPC) H01R B61L
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 March 2008	Examiner Demol, Stefan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPC FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 02 4452

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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13-03-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9709193 A	13-03-1997	AT 197577 T	15-12-2000
		DE 69610988 D1	21-12-2000
		DE 69610988 T2	15-03-2001
		DK 847339 T3	11-12-2000
		EP 0847339 A1	17-06-1998
		ES 2151674 T3	01-01-2001
		GR 3035291 T3	30-04-2001
		HU 9900646 A2	28-07-1999
		NL 1001121 C2	04-03-1997
		NO 980889 A	30-04-1998
		PL 328765 A1	15-02-1999
		PT 847339 T	28-02-2001
		TR 9800363 T1	21-05-1998

US 2006281359 A1	14-12-2006	NONE	

DE 405128 C	30-10-1924	NONE	

GB 2391724 A	11-02-2004	GB 2391718 A	11-02-2004
		US 2004072467 A1	15-04-2004

US 2275367 A	03-03-1942	NONE	

WO 9702169 A	23-01-1997	AT 188929 T	15-02-2000
		DE 69606297 D1	24-02-2000
		DE 69606297 T2	14-09-2000
		DK 835202 T3	08-05-2000
		EP 0835202 A1	15-04-1998
		HU 9900325 A2	28-05-1999
		NL 1000713 C2	31-12-1996
		NO 976089 A	18-02-1998
		PL 324261 A1	11-05-1998
		TR 9701747 T1	21-04-1998

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- NL 1000713 [0006] [0009] [0010]
- NL 1001121 [0010]