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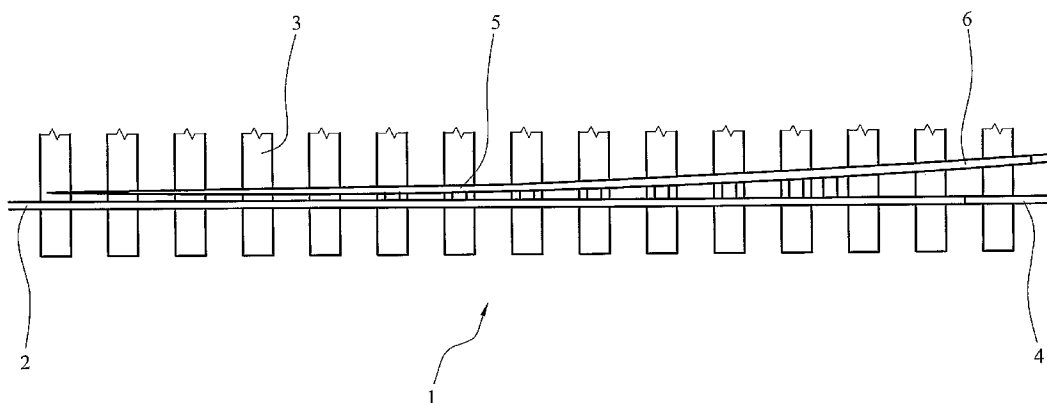
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(54) Title: A RAILWAY SWITCH



(57) Abstract: A railway switch (7) comprises an inbound rail (8), first and second outbound rails (9, 10) which converge towards the inbound rail (8), a fixing means (11) connected to the inbound rail (8), and an urging means (14). The fixing means (11) divides the inbound rail (8) into a free portion (13) extending from the end of the inbound rail (8) proximate to the outbound rail (9, 10) to the fixing means (11), and a fixed portion (12) extending from the fixing means (11) away from the outbound rails (9, 10), the fixed portion (12) being fixed in relation to the outbound rails (9, 10). The urging means (14) is arranged to reciprocally displace the free portion (13) between a first position wherein the end of the inbound rail (8) is aligned with the end of the first outbound rail (9), and a second position wherein the end of the inbound rail (8) is aligned with the end of the second outbound rail (10). There is also disclosed a railway mechanism comprising a pair of such railway switches (7) in which the free portion (12) of the inbound rail (8) of the first switch (7) is connected to the free portion (12) of the inbound rail (8) of the second switch (7) by at least one gauge bar (23).

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A Railway Switch

The present invention relates to a railway switch and also to a rail mechanism including such a railway switch. More particularly, but not exclusively, the present invention relates to a railway switch having a free portion of an inbound rail adapted to be urged between first and second positions wherein the end of the rail is aligned with the ends of first and second outbound rails respectively.

Railway switches where a single inbound rail splits into first and second outbound rails are well known. Such known switches typically include a tapered guide rail. In a first position the guide rail is spaced apart from the inbound rail. As the train passes along the inbound rail it moves smoothly onto the first outbound rail. In a second position the tapered guide rail abuts the incoming rail with the taper facing towards the direction of the incoming train. The wheel of a train which arrives at the guide rail is directed onto the guide rail and then onto the second outbound rail.

Such an arrangement has a number of drawbacks. Tapered rails are difficult and expensive to manufacture. Also, the thin point of the tapered rail wears away quickly. This can result in jolting of the train as it passes over the switch. In addition, the tapered rail sits on a hard surface, thus changing the running characteristics of the train passing over it.

The railway switch according to the invention seeks to overcome these problems and/or more generally offer improvements or an alternative to such existing arrangements.

According to the present invention there is therefore provided a railway switch, and a railway mechanism comprising a pair of such railway switches, as described in the accompanying claims.

30

In an embodiment of a first aspect of the invention there is provided a railway switch comprising an inbound rail, first and second outbound rails which converge towards the inbound rail, a fixing means connected to the inbound rail and dividing the inbound rail into a free portion extending from the end of the inbound rail proximate to the outbound rail to the fixing means and a fixed portion extending from the fixing means away from the outbound rails, and an urging means for reciprocally displacing the free portion between a first position wherein the end of the inbound rail is aligned with the end of the first outbound rail and a second position wherein the end of the inbound rail is aligned with the end of the second outbound rail. The fixed portion is fixed in relation to the outbound rails.

Such a railway switch smoothly guides the train to either of the first and second rails. In addition, as the free portion of the inbound rail which diverts the train between first and second rails is not tapered it is long lasting and relatively inexpensive to manufacture.

Preferably, the urging means elastically deforms the free portion of the inbound rail between first and second positions. Alternatively, the urging means pivots the free portion of the inbound rail between the first and second positions.

The urging means can comprise a sliding member engaged with the rail and adapted to be displaced between first and second positions. The sliding member can be received within a guide surface to limit the movement of the sliding member. The guide surface can comprise end walls against which the sliding member abuts in the first and second positions respectively to limit the motion of the sliding member.

Preferably, the guide surface is adapted to allow for expansion and contraction of the rail.

Preferably, the railway switch comprises a plurality of urging means spaced along the free portion of the inbound rail. The urging means can be equally spaced along the length of the free portion.

5 The urging means can be connected together by a lock rod. The lock rod can be connected to a pull bar such that displacement of the pull bar displaces the lock rod and hence the urging means. Preferably, each urging means is free to be displaced by a different amount depending upon its distance from the fixing means.

10 Preferably, the railway switch comprises an expansion resisting means connected to the inbound rail to resist expansion and contraction of the inbound rail towards or away from the outbound rails.

 Preferably, the fixed portion of the inbound rail comprises an expansion accepting
15 device for accepting expansion and contraction of the inbound rail.

 In a further aspect of an embodiment of the invention there is provided a railway mechanism comprising a pair of railway switches. Each railway switch comprises an inbound rail, first and second outbound rails which converge towards the inbound rail, a
20 fixing means connected to the inbound rail and dividing the inbound rail into a free portion extending from the end of the inbound rail proximate to the outbound rail to the fixing means and a fixed portion extending from the fixing means away from the outbound rails, and an urging means for reciprocally displacing the free portion between
25 a first position wherein the end of the inbound rail is aligned with the end of the first outbound rail and a second position wherein the end of the inbound rail is aligned with the end of the second outbound rail. The fixed portion is fixed in relation to the outbound rails, and the free portion of the inbound rail of the first switch is connected to the free portion of the inbound rail of the second switch by at least one gauge bar.

The present invention will now be described by way of example only and not any limitative sense with reference to the accompanying drawings in which

Figure 1 shows a known railway switch;

5 Figure 2 shows a railway switch according to an embodiment of the invention; and,

Figure 3 shows a railway mechanism according to an embodiment of the invention.

10

Figure 1 shows a known railway switch 1. The railway switch 1 comprises an inbound rail 2 connected to rail sleepers 3. The inbound rail 2 continuously extends into a first outbound rail 4 as shown.

15 The railway switch 1 further comprises a guide rail 5 one end of which tapers towards the inbound rail 2. The opposite end of the guide rail 5 continuously extends into a second outbound rail 6.

20 The railway switch 1 is shown in a first configuration with the guide rail 5 separated from the inbound rail 2. As a train passes over the switch 1 in this configuration the train wheel passes smoothly from the inbound rail 2 to the first outbound rail 4.

25 The switch 1 can be changed to a second configuration by displacing the guide rail 5 laterally until it abuts the inbound rail 2. In this configuration as the train passes over the switch 1 the train wheel is guided from the first rail 2 onto the guide rail 5 and then to the second outbound rail 6. As the wheel jumps from the inbound rail 2 to the guide rail 5 the train jolts. This is also wearing on the guide rail 5 which needs to be replaced frequently.

Figure 2 shows a switch 7 according to an embodiment of the invention. The switch 7 comprises an inbound rail 8 and first and second outbound rails 9,10. The first and second outbound rails 9,10 converge together towards the inbound rail 8.

5 A fixing means 11 is connected to the inbound rail 8 dividing the inbound rail 8 into fixed 12 and free 13 portions. The fixed portion 12 extends from the fixing means 11 away from the outbound rails 9, 10. The first fixing means 11 and a series of further fixing means (not shown) maintain the fixed portion 12 in fixed relation to the first and second outbound rails 9,10.

10 The free portion 13 of the inbound rail 8 extends from the fixing means 11 to the end of the inbound rail 8 proximate to the outbound rails 9,10. This portion 13 of the inbound rail 8 is free to be displaced laterally in response to an external force.

15 Connected to the free portion 13 of the inbound rail 8 is a plurality of sliding members 14. Each sliding member 14 is received within a guide surface 15 within anchor blocks 16. The anchor blocks 16 are connected to sleepers 17 regularly spaced below the inbound rail 8. Each guide surface 15 comprises end walls 18 which limit the motion of the sliding members 14 within the guide surfaces 15 but allow longitudinal
20 movement to accommodate normal expansion and contraction of the rail 8.

Each sliding member 14 is connected to a lock rod 19 by means of a sliding member bar 20. Connected to the lock rod 19 is a pull bar 21 which is in turn connected to a control means (not shown) for changing the switch 7 between states. In use the
25 control means displaces the pull bar 21 which in turn pulls or pushes the lock rod 19. The lock rod 19 in turn causes each sliding member 14 to slide within its guide surface 15 until it abuts the end wall 18. Displacement of the sliding member 14 displaces the free portion 13 of the inbound rail 8.

30 Each guide surface 15 has end walls 18 in slightly different positions. The sliding members 14 closer to the fixing means 11 have less range of movement than the sliding

members 14 further away and so will stop moving before the sliding members 14 further away from the fixing means 11. The positions of the end walls 18 will therefore determine the shape of the free portion 13 in its two configurations.

5 The switch 7 is shown in a first configuration in figure two. In this configuration the inbound rail 8 is straight with the end of the inbound rail 8 aligned with the end of the first outbound rail 9. The wheel of a train passing over the switch 7 will therefore move smoothly from the inbound rail 8 to the outbound rail 9.

10 The end of the inbound rail 8 proximate to the outbound rails 9,10 comprises an expansion resisting means (not shown) to resist the expansion or contraction of the inbound rail 8 towards or away from the outbound rails 9,10. The fixed portion 12 of the inbound rail 8 also comprises an expansion accepting device for accepting expansion and contraction of the inbound rail 8.

15 In a second configuration (not shown) the end of the inbound rail 8 is aligned with the end of the second outbound rail 10. The end walls 16 of the guide surfaces 15 are arranged such that the free portion 13 of the inbound rail 8 smoothly curves to meet the end of the second outbound rail 10. A wheel of a train passing over the switch 7 in this
20 configuration will pass smoothly around the bend in the free portion 13 of the inbound rail 8 and then onto the second outbound rail 10.

 In both configurations the train wheel passes smoothly from the inbound rail 8 to either the first or second outbound rails 9,10. In addition, the inbound rail 8 is not tapered
25 and accordingly is relatively inexpensive to manufacture. Also, the inbound rail 8 can be fastened to the sliding member 14 using the common fastening system, thus providing consistency of ride for the train.

 Figure 3 shows a rail mechanism 22 according to an embodiment of the invention.
30 The rail mechanism 22 comprises two rail switches 7 according to the invention. The two

free portions of the two inbound rails 8 are connected together by a gauge bars 23 to ensure the correct spacing between the inbound rails 8 at all times.

5 In a further embodiment of the invention (not shown) the switch 7 comprises only one urging means close to the first and second outbound rails 9,10 for urging the free portion 13 between first and second configurations.

10 The principle and mode of operation of this invention have been explained and illustrated in its preferred embodiment. However, it must be understood that this invention may be practiced otherwise than as specifically explained and illustrated without departing from its spirit or scope.

Claims

1. A railway switch (7) comprising:

5 an inbound rail (8);
first and second outbound rails (9,10), the outbound rails (9,10)
converging towards the inbound rail (8);

a fixing means (11) connected to the inbound rail (8) and dividing the
inbound rail (8) into a free portion (13) extending from the end of the inbound rail
10 (8) proximate to the outbound rail (9,10) to the fixing means (11), and a fixed
portion (12) extending from the fixing means (11) away from the outbound rails
(9,10), the fixed portion (12) being fixed in relation to the outbound rails (9,10);
and,

15 an urging means (14) for reciprocally displacing the free portion (13)
between a first position wherein the end of the inbound rail (8) is aligned with the
end of the first outbound rail (9), and a second position wherein the end of the
inbound rail (8) is aligned with the end of the second outbound rail (10).

2. A railway switch (7) as claimed in claim 1, wherein the urging means (14)
20 elastically deforms the free portion (13) of the inbound rail (8) between first and
second positions.

3. A railway switch (7) as claimed in either of claims 1 or 2, wherein the urging
means (14) pivots the free portion (13) of the inbound rail (8) between the first
25 and second positions.

4. A railway switch (7) as claimed in any one of claims 1 to 3, wherein the urging
means (14) comprises a sliding member (14) engaged with the rail (8) and adapted
to be displaced between first and second positions.

30

5. A railway switch (7) as claimed in claim 4, wherein the sliding member (14) is received within a guide surface (15) to limit the movement of the sliding member (14).
- 5 6. A railway switch (7) as claimed in claim 5, wherein the guide surface (15) comprises end walls (18) against which the sliding member (14) abuts in the first and second positions respectively to limit the motion of the sliding member (14).
7. A railway switch (7) as claimed in either of claims 5 or 6, wherein the guide
10 surface (15) is adapted to allow for expansion and contraction of the rail (8).
8. A railway switch (7) as claimed in any one of claims 1 to 7 comprising a plurality of urging means (14) spaced along the free portion (13) of the inbound rail (8).
- 15 9. A railway switch (7) as claimed in claim 8, wherein the urging means (14) are equally spaced along the length of the free portion (13).
10. A railway switch (7) as claimed in either of claims 8 or 9, wherein the urging
20 means (14) are connected together by a lock rod (19)
11. A railway switch (7) as claimed in claim 10, wherein the lock rod (19) is connected to a pull bar (21) such that displacement of the pull bar (21) displaces the lock rod (19) and hence the urging means (14).
- 25 12. A railway switch (7) as claimed in claim 11, wherein each urging means (14) is free to be displaced by a different amount depending upon its distance from the fixing means (11).
- 30 13. A railway switch (7) as claimed in any one of claims 1 to 12, comprising an expansion resisting means connected to the inbound rail (8) to resist expansion

and contraction of the inbound rail (8) towards or away from the outbound rails (9,10).

14. A railway switch (7) as claimed in any one of claims 1 to 13, wherein the fixed
5 portion (12) of the inbound rail (8) comprises an expansion accepting device for
accepting expansion and contraction of the inbound rail (8).
15. A railway mechanism (22) comprising a pair of railway switches (7) as claimed in
any one of claims 1 to 14, the free portion (12) of the inbound rail (8) of the first
10 switch (7) being connected to the free portion (12) of the inbound rail (8) of the
second switch (7) by at least one gauge bar (23).

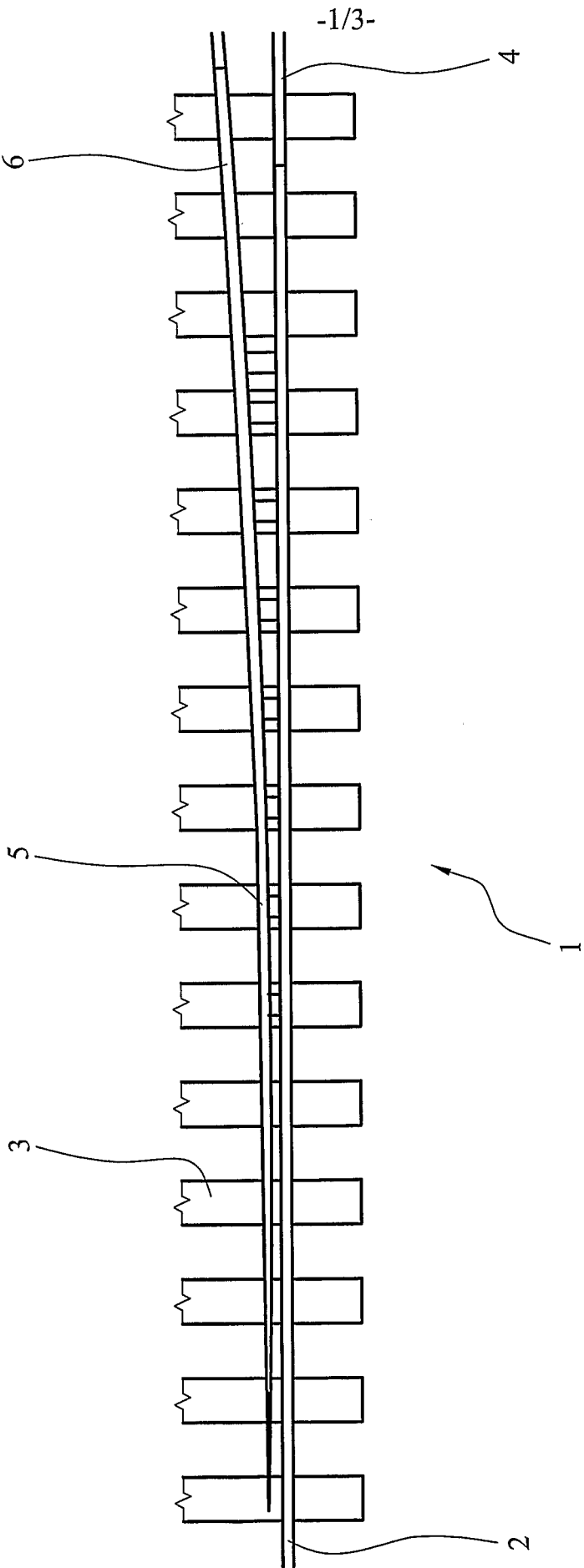


FIG. 1

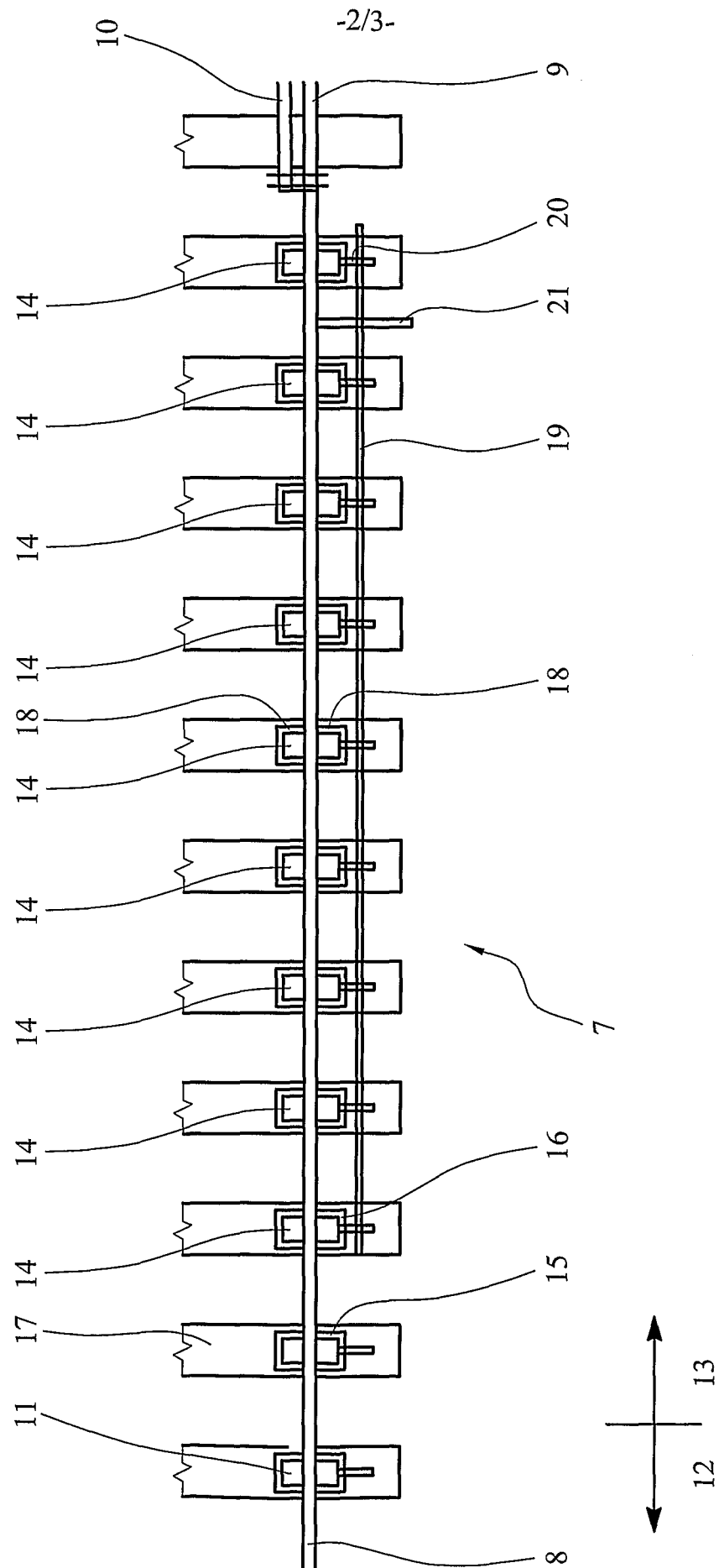


FIG. 2

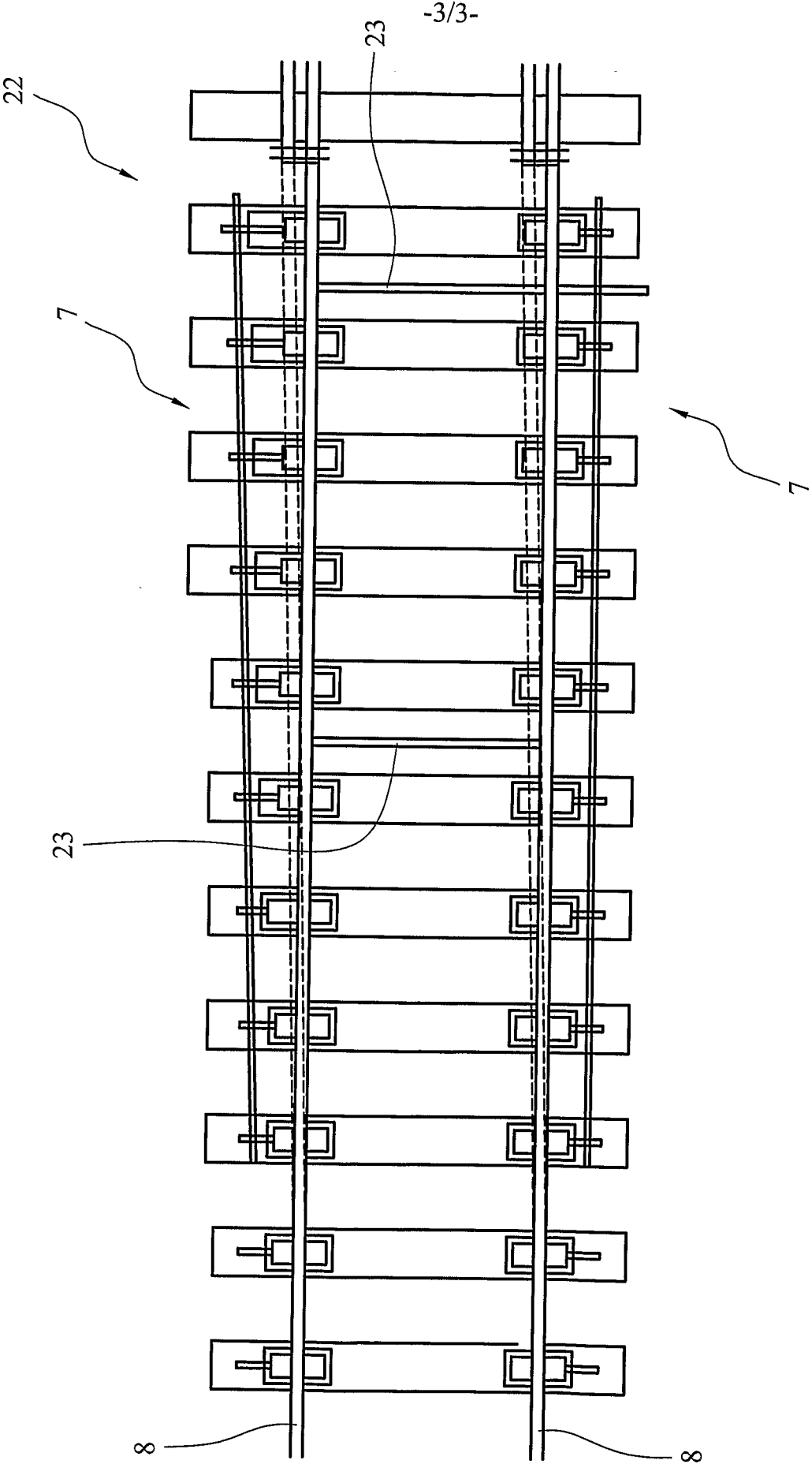


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/000826

A. CLASSIFICATION OF SUBJECT MATTER

INV. B61L5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 770 614 A (GEORGE-MOORE) 20 September 1904 (1904-09-20) the whole document -----	1-15
X	EP 0 315 621 A2 (VOEST ALPINE MASCHINENBAU [AT]) 10 May 1989 (1989-05-10) abstract; figures 3-5 -----	1-6, 8-12, 15
X	GB 2 019 626 A (ELEKTRO THERMIT GMBH) 31 October 1979 (1979-10-31) abstract; figures 3, 4 -----	1-6, 8-12, 15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 770614	A	NONE	
EP 0315621	A2	10-05-1989	
		AT 83813 T	15-01-1993
		DE 3876950 D1	04-02-1993
		DK 617788 A	06-05-1989
		ES 2038343 T3	16-07-1993
		GR 3007432 T3	30-07-1993
		IN 170171 A1	22-02-1992
		NO 884939 A	08-05-1989
		PL 275619 A1	10-07-1989
		US 4927102 A	22-05-1990
		YU 202188 A1	30-06-1991
GB 2019626	A	31-10-1979	
		AT 361024 B	10-02-1981
		AT 299679 A	15-07-1980
		DE 2817782 A1	25-10-1979
		FR 2423389 A1	16-11-1979
		JP 1250750 C	14-02-1985
		JP 54142705 A	07-11-1979
		JP 59026721 B	30-06-1984
		US 4210300 A	01-07-1980