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(54)

Turnout base plate fastening structure

(57) In a turnout base plate fastening structure, a base plate (2) is fixed on a sleeper (1) by a base plate fastening device (3) and a rail (7) is fastened on the base plate (2) by a rail fastening device (10). The base plate can have a rail fixing recess (9) and a rail brace fixing recess (14).

End surfaces of the base plate (2) in the longitudinal direction thereof are formed as curved surfaces formed by a circular arc, as are facing surfaces of the base plate

fastening device (3). The orientation of the base plate on the fastening device can thus be varied to accommodate the differing angles at which rails must be mounted in the various parts of a turnout, while keeping the same orientation of the base plate fastening device on the sleeper.

An electrical insulator (6) can be positioned between the base plate (2) and the base plate fastening device (3).

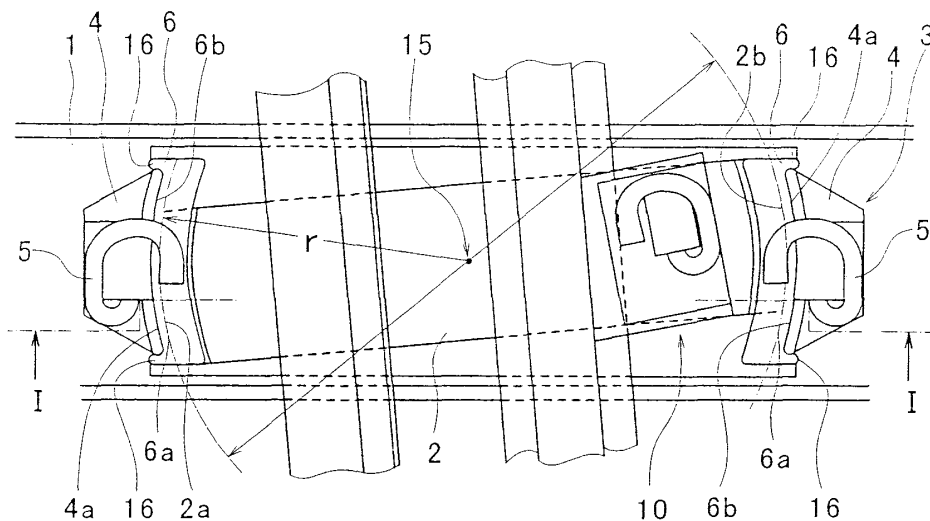


Fig. 2 A

Description

[0001] The present invention relates to a turnout base plate fastening structure.

[0002] In general, as shown in FIG. 8, a turnout has a structure in which a steel base plate 22 is fixed on a sleeper 21, a stock rail 23 is fixed on the base plate 22, and a tongue rail 24 provided adjacent to the stock rail 23 is adapted to slide rightward or leftward by means of a shunt (not shown) on the base plate 22. A variety of rail fastening devices in the turnout for a rail track can be used, and two methods described below are commonly employed. One method is a washer method in which a washer is fixed on the base plate such that its right and left positions are adjustable by means of a bolt and a base portion of the rail is pressed by an end of the washer, to thereby fasten the rail to the base plate. In the other method, as shown in FIG. 9, a rail brace 31 having a substantially L-shaped side surface is fixed on a base plate 33 such that its right and left positions are adjustable by means of a bolt 32, and an upper end portion of the rail brace 31 and an L-shaped curved portion 37 of the rail brace 31 are adapted to abut against an upper side portion 35 or chin portion 36 of a stock rail 34 and an upper surface of the base portion 38 of the rail 34, respectively, to thereby fasten the rail 34 to the base plate 33, thus preventing the tilting of the rail 34 (see Japanese Utility Model Publication No. Sho. 48-12651).

[0003] In either case, in order to fix the rail 34 shown in FIG. 9 on the base plate 33 and prevent unnatural force from being generated, it is preferable to place the base plate on the sleeper such that the fixed rail 34, positioned in a rail fixing recess 39 on the base plate 33, and a fixing recess 40 of the rail brace 31 are parallel with each other or one is slightly inclined with respect to the other (the fixing recess 40 is inclined with respect to the rail fixing recess 39).

[0004] The turnout comprises, as major components, a point section 41, a lead section 42, a crossing section 43, and a guard section 44, as shown in FIG. 10. In any of these sections, rails 46 are mounted on sleepers 45 with a successively varying positional relationship. The rails 46 and the sleepers 45 are not at right angles with each other, and the crossing angle is also successively changing. The length of the sleeper also must be changed according to where it is positioned.

[0005] As shown in FIG. 11, when using wooden sleepers for a stock rail in a turnout that has a changing curvature, the positions at which base plates 51, 55, 56, and 57 are placed on wooden sleepers 54 are gradually varied according to the change of the curvature of the stock rail 52 in order to maintain the above positional relationship between the stock rail 52 fixed on the base plate and a fixing recess of a rail brace (or washer) 53. These base plates can be fixed on the wooden sleepers 54 by means of track spikes or screw spikes. However, wood as a sleeper material is expensive. In addition, the

wooden sleepers must be replaced due to the rot of them with a lapse of time, and resource protection should be taken into account. Under the circumstances, there is a need for a more preferable material of sleepers.

[0006] When precast concrete (PC) sleepers are used in place of the wooden sleepers, the spikes cannot be used for fixing the base plate on the PC sleeper. Referring to FIGS. 12A and 12B, an anchor 62 or 63 protruding from a lower portion of a base plate fastening device 61 is inserted into a PC sleeper 64 and secured thereto. The PC sleepers are preferable in an ordinary rail section using a great number of sleepers having the same configuration because they are manufactured at low cost. However, as shown in FIGS. 12A and 12B, many steel rods 65 or piano wires 66 for reinforcement are embedded in the PC sleeper 64. Therefore, when the positions of base plates 68, 69, 70, and 71 placed on the stock rail 67 having a changing curvature are successively varied in order to maintain the above relationship between the stock rail and the fixing recess of the rail brace (or washer) as shown in FIG. 13, it is necessary to insert the anchor of the base plate fastening device 72 into the PC sleeper 73 such that the anchor is not contact with the steel rod or the piano wires. For this reason, the usage of the PC sleepers having reinforcements embedded at the same positions is limited. The base plates are mounted on the sleepers at different angles and positions according to types of the turnout and for respective PC sleepers, which requires many types of moulds of the PC sleepers that have a complicated structure and causes increased cost. As a consequence, the PC sleepers are less suitable for a particular track such as the turnout.

[0007] As shown in FIG. 14, for a stock rail 67 in a turnout having a changing curvature, with base plates 68, 69, 70, and 71 placed on PC sleepers 73 at the same positions (at the centre in the direction of width of the sleepers 73), it is relatively easy to prevent an anchor of a base plate fastening device 72 from making contact with steel rods or piano wires in the PC sleepers 73. In this case, however, it is required that base plates be processed differently according to the types of the turnout and for respective PC sleepers in order to maintain the above positional relationship between the stock rail 67 and the fixing recess of the rail brace (or washer), and this would be very cumbersome.

[0008] At least the preferred embodiments of the present invention are directed to solving the above-described problem of the prior art, and an object of the preferred embodiments of the present invention is to provide a turnout base plate fastening structure which reduces the number of types of base plate, PC sleepers, or steel sleepers.

[0009] According to a first aspect of the present invention, there is provided a turnout base plate fastening structure in which the base plate is fixed on a sleeper by a base plate fastening device and a rail is fastened

to the base plate by a rail fastening device, characterized in that the base plate has a rail fastening device fixing recess, and in that each of the end faces of the base plate in a longitudinal direction thereof is formed as a curved surface formed by a circular arc of a circle made with a centre of the base plate as a centre of the circle, and a surface of the base plate fastening device is formed such that it abuts against the curved surface of the base plate and is a curved surface corresponding to the curved surface of the base plate.

[0010] With this configuration, many base plates having the same configuration capable of maintaining the positional relationship between the rail in the longitudinal direction thereof and the rail fastening device fixing recess are prepared for. The base plate fastening devices are placed at different positions in the longitudinal direction of the sleepers but at the same positions in the lateral (width) direction thereof such that centres of the devices match corresponding centres of the sleepers. The curved surfaces formed by the circular arc of the circle (circular-arc surfaces) at both ends of the base plate are rotated by a predetermined angle along the circular-arc surfaces of the base plate fastening devices. The rail is fastened by the rail fastening device to be fixed on the base plate. The rail fastening device is fixed in the rail fastening device fixing recess. The base plate is fastened on the sleeper by the base plate fastening device.

[0011] Thus, since the base plate fastening devices are placed at different positions in the longitudinal direction of the sleepers but at the same positions in the lateral (width) direction thereof such that centres of the devices match corresponding centres of the sleepers, angles at which the base plates are to be fastened are not limited, irrespective of the type of turnout. Therefore, any kind of PC sleepers can be used for all kinds of turnouts. That is, the PC sleepers can be used with the turnout. In addition, since the base plates having the same configuration are used, this is very cost-effective. Further, the present invention is not limited to PC sleepers but is applicable to steel sleepers, resinous sleepers, or slab plates.

[0012] Preferably, an electric insulator is interposed between the base plate fastening device and the base plate such that the electric insulator abuts against the base plate fastening device and the base plate, the electric insulator having projections provided at portions with which the base plate fastening device is in contact for preventing the base plate fastening device from being released, a surface of the electric insulator being formed such that it abuts against the curved surface of the base plate and is a curved surface corresponding to the curved surface of the base plate, and a further surface of the electric insulator being formed such that it abuts against the curved surface of the base plate fastening device and is a curved surface corresponding to the curved surface of the base plate fastening device.

[0013] Through the use of such an electric insulator

abutting against the base plate fastening device and the base plate, the projections provided at the electric insulator prevent the base plate fastening device from being released, which reliably avoids the release of the device.

[0014] According to a second aspect of the present invention, there is provided a turnout base plate fastening structure in which the base plate is fixed on a sleeper by a base plate fastening device and a rail is fastened to the base plate by a rail fastening device, characterized in that an electric insulator is interposed between the base plate fastening device and the base plate such that the electric insulator abuts against the base plate fastening device and the base plate, side end portions of the base plate are capped with members protruding from both ends of the electric insulator, the base plate has a rail fastening device fixing recess, a surface of the electric insulator is formed such that it abuts against the base plate fastening device and is a curved surface formed by a circular arc of a circle made with a centre of the base plate as a centre of the circle, and a surface of the base plate fastening device is formed such that it abuts against the curved surface of the electric insulator and is a curved surface corresponding to the curved surface of the electric insulator.

[0015] The side end portions of the base plate are capped with the members protruding from both ends of the electric insulator. With this configuration, the electric insulators are integral with the base plate and the circular-arc surfaces of the electric insulators abutting against the base plate fastening devices are rotated at a predetermined angle along the circular-arc surfaces of the base plate fastening devices, to thereby position the base plate on the sleeper.

[0016] It is further preferred that the base plate further has a rail fixing recess.

[0017] With this configuration, the rail is fixed in the rail fixing recess, to improve fixation of the rail.

[0018] The invention also extends to a base plate for use in a turnout base plate fastening structure as defined above.

[0019] Preferred embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings, in which:

FIG. 1 is a cross-sectional view taken substantially along the line I-I of FIG. 2A;

FIG. 2A is a plan view showing a first embodiment of a turnout base plate fastening structure according to the present invention, and FIG. 2B is an end view of an electrical insulator;

FIG. 3 is a cross-sectional view taken substantially along the line III-III of FIG. 4A;

FIG. 4A is a plan view showing a second embodiment of a turnout base plate fastening structure according to the present invention, and FIG. 4B is an end view of an electrical insulator;

FIG. 5 is a sectional side elevation view showing still another embodiment of a turnout base plate fas-

tening structure according to the present invention; FIG. 6 is a plan view showing a turnout base plate fastening structure according to the present invention when applied to a left-side turnout; FIG. 7 is a plan view showing a turnout base plate fastening structure according to the present invention when applied to a right-side turnout; FIG. 8 is a cross-sectional view showing an example of a turnout; FIG. 9 is an elevational view showing a conventional brace-type rail fastening device; FIG. 10 is a plan view schematically showing a turnout; FIG. 11 is a plan view showing an example in which a conventional fastening structure of a base plate for a turnout is applied to wooden sleepers; FIG. 12A is a sectional side elevation view showing an example in which an anchor of a base plate fastening device is inserted into a PC sleeper and FIG. 12B is a sectional side elevation view showing another example in which an anchor of a base plate fastening device is inserted into a PC sleeper; FIG. 13 is a plan view showing an example in which a conventional fastening structure of a base plate for a turnout according to the prior art is applied to a PC sleeper; and FIG. 14 is a plan view showing another example in which a conventional fastening structure of a base plate for a turnout according to the prior art is applied to a PC sleeper.

[0020] Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings.

[0021] Referring now to FIGS. 1 and 2, PC sleepers 1 are placed in a track bed at appropriate intervals and parallel with each other (at right angles to a rail). Placed on the sleeper 1 is a base plate 2 fixed by means of a base plate fastening device 3 with a plate 2' interposed between them. The base plate fastening device 3 is adapted to press the base plate 2 downward by an elastic force of a wire spring clip 5 inserted through a hole formed in a member 4 fixed on the PC sleeper 1 by an anchor 62 or 63 shown in FIG. 12, to thereby fix the base plate 2 on the PC sleeper 1. In this embodiment, between each end face of the base plate 2 and the base plate fastening device 3, an electric insulator 6 is interposed such that it abuts against both of them. The electric insulator 6 may be dispensed with as necessary.

[0022] Reference numeral 7 denotes a stock rail and reference numeral 8 denotes a tongue rail. A rail base 7a of the stock rail 7 is in a rail fixing recess 9 and the stock rail 7 is fixed on the base plate 2 by a rail fastening device 10. The rail fastening device 10 is a brace-type elastic fastening device without using a screw or a spike, in which a clip engagement member 11 having an inversely U-shaped configuration is fixed on the base plate 2 by welding. A rail brace 12 has holes penetrating

through a rear portion thereof, into which the clip engagement member 11 is fitted, and a wire spring clip 13 having a substantially spiral configuration seen in a plan view is placed on the rail brace 12 such that it is elastically deformed and an end portion thereof is inserted into the clip engagement member 11, to thereby fasten the rail brace 12 and the rail 7 by an elastic force of the wire spring clip 13. A protrusion 12a of the rail brace 12 is fixed in a rail brace fixing recess (rail fastening device fixing recess) 14.

[0023] As shown in FIG. 2A, end faces 2a and 2b of the base plate 2 in the longitudinal direction thereof are formed as being curved surfaces formed by a circular arc of a circle made with a centre 15 of the base plate 2 as a centre of the circle and a radius r (referred to as "circular-arc surfaces"). Inner surfaces 6a of the electric insulators 6 are formed such that they abut against the circular-arc surfaces 2a and 2b, respectively, at both ends of the base plate 2 and are circular-arc surfaces corresponding to the circular-arc surfaces 2a and 2b. Likewise, outer surfaces 6b of the electric insulators 6 are formed as being circular-arc surfaces. Surfaces 4a of members 4 of the base plate fastening devices 3 are formed such that they abut against the outer surfaces 6b of the electric insulators 6 and are circular-arc surfaces corresponding to the outer surfaces 6b. Each of the electric insulators 6 has projections 16 at portions with which the member 4 is in contact, for preventing the base plate fastening device 3 from being released (see FIG. 2B). It should be noted that the projections may be entirely formed in the vertical direction. When no electric insulators are provided, the surfaces 4a of the members 4 are formed such that they abut against the circular-arc surfaces 2a and 2b of the base plate 2 and are circular-arc surfaces corresponding to the circular-arc surfaces 2a and 2b.

[0024] Referring to FIGS. 3 and 4, between each end face of the base plate 2 and the base plate fastening device 3, an electric insulator 17 is interposed such that it abuts against both of them. Side end portions of the base plate 2 are capped with members 18 (see FIG. 4B) protruding from both ends of the electric insulators 17. Surfaces 17a of the electric insulators 17 are formed such that they abut against the surfaces 4a of the members 4 and they are curved surfaces formed by a circular-arc of a circle made with a centre 15 of the base plate 2 as a centre and a radius r. Likewise, the surfaces 4a of the members 4 are formed such that they abut against the circular-arc surfaces 17a of the electric insulators 17 and are circular-arc surfaces corresponding to the circular-arc surfaces 17a. According to this embodiment, the electric insulators 17 are integral with the base plate 2 and the electric insulators 17 are rotated at a predetermined angle along the circular-arc surfaces 4a of the members 4, to thereby position the base plate 2 on the PC sleeper 1.

[0025] Referring to FIG. 5, there is illustrated a fastening structure of the base plate for the turnout accord-

ing to the present invention, in which no rail fixing recess for fixing a rail base of a stock rail 7 is formed.

[0026] Referring to FIGS. 6 and 7, although all the base plate fastening devices 3 are placed at different positions in the longitudinal direction of the sleepers 1, they are placed at the same positions in the lateral (width) direction of the PC sleepers 1 such that centres of the fastening devices 3 match corresponding centres of the PC sleepers 1. Therefore, anchors are inserted into PC sleepers at the same positions such that they are not in contact with steel rods or piano wires embedded in the PC sleepers. As a consequence, one type of PC sleepers can be used.

[0027] As can be appreciated from the foregoing description, the preferred embodiments of the present invention make it possible to provide a turnout base plate fastening structure which reduces the number of types of base plates, PC sleepers, or steel sleepers. Since the base plate fastening devices are placed at different positions in the longitudinal direction of the sleepers but at the same positions in the lateral (width) direction thereof such that centres of the devices match corresponding centres of the sleepers, the angles at which the base plates are to be fastened are not limited irrespective of types of the turnout. Therefore, any kinds of sleepers which are commonly used can be used with all kinds of turnout. That is, PC sleepers may be used in a turnout. In addition, since base plates having the same configuration are used, this is very cost-effective.

[0028] Further, the present invention is not limited to the PC sleepers but is applicable to steel sleepers, resinous sleepers, or slab plates, and when applied to these, the same effects can be achieved. Still further, the projections provided at the electric insulators for preventing the base plate fastening device from being released reliably avoids the release of the device. Moreover, since the rail is fixed in the rail fixing recess, fixation of the rail is improved.

[0029] Numerous modifications and alternative embodiments of the invention will be apparent to those skilled in the art in view of the foregoing description. Accordingly, the description is to be construed as illustrative only, and is provided for the purpose of teaching those skilled in the art the best mode of carrying out the invention. The details of the structure and/or function may be varied substantially without departing from the scope of the invention.

Claims

1. A turnout base plate fastening structure in which the base plate (2) is fixed on a sleeper (1) by a base plate fastening device (3) and a rail (7) is fastened to the base plate (2) by a rail fastening device (10), characterized in that

the base plate (2) has a rail fastening device fixing recess (14), and in that each of the end faces

(2a, 2b) of the base plate (2) in a longitudinal direction thereof is formed as a curved surface formed by a circular arc of a circle made with a centre (15) of the base plate as a centre of the circle, and a surface (4a) of the base plate fastening device is formed such that it abuts against the curved surface of the base plate and is a curved surface corresponding to the curved surface of the base plate.

2. A fastening structure as claimed in claim 1, characterized in that

an electric insulator (6) is interposed between the base plate fastening device (3) and the base plate (2) such that the electric insulator abuts against the base plate fastening device (3) and the base plate (2), the electric insulator having projections (16) provided at portions with which the base plate fastening device is in contact for preventing the base plate fastening device (3) from being released, a surface (6a) of the electric insulator being formed such that it abuts against the curved surface of the base plate (2) and is a curved surface corresponding to the curved surface of the base plate (2), and a further surface (6b) of the electric insulator being formed such that it abuts against the curved surface of the base plate fastening device (3) and is a curved surface corresponding to the curved surface of the base plate fastening device (3).

3. A turnout base plate fastening structure in which the base plate (2) is fixed on a sleeper (1) by a base plate fastening device (3) and a rail (7) is fastened to the base plate (2) by a rail fastening device (10), characterized in that

an electric insulator (17) is interposed between the base plate fastening device (3) and the base plate (2) such that the electric insulator abuts against the base plate fastening device (3) and the base plate (2), side end portions of the base plate are capped with members (18) protruding from both ends of the electric insulator, the base plate has a rail fastening device fixing recess (14), a surface (17a) of the electric insulator is formed such that it abuts against the base plate fastening device and is a curved surface formed by a circular arc of a circle made with a centre (15) of the base plate as a centre of the circle, and a surface (4a) of the base plate fastening device is formed such that it abuts against the curved surface of the electric insulator and is a curved surface corresponding to the curved surface of the electric insulator.

4. A fastening structure as claimed in any of claims 1 to 3, characterized in that

the base plate further has a rail fixing recess (9).

5. A base plate for use in a fastening structure as

claimed in any preceding claim.

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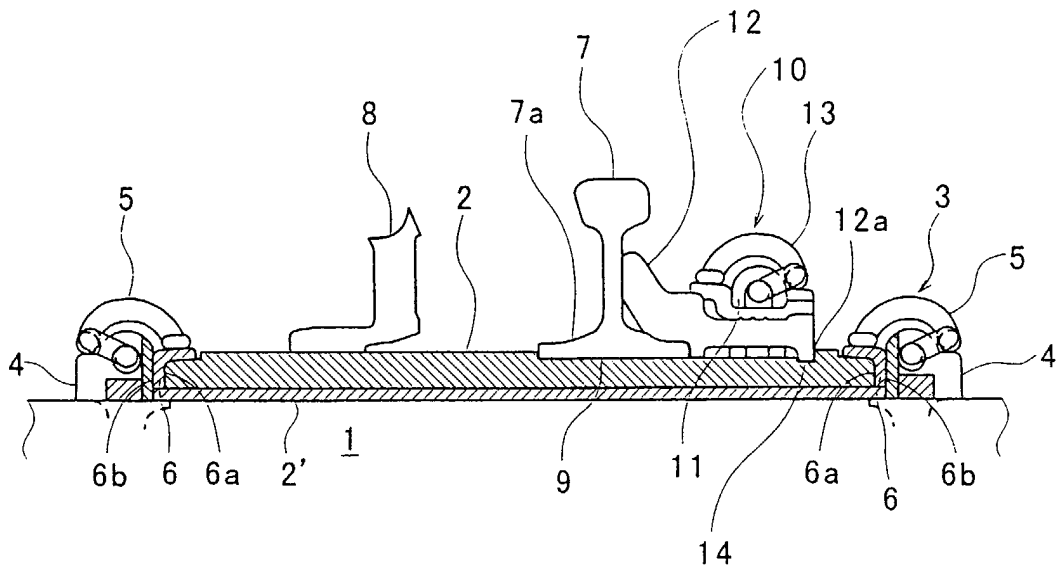


Fig. 1

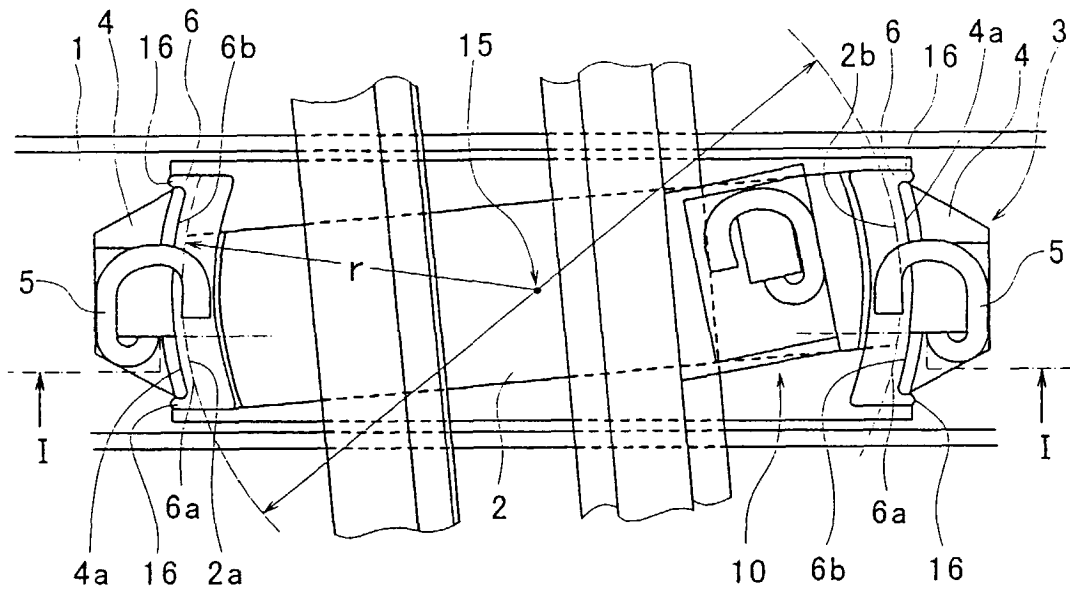


Fig. 2 A

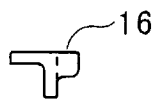


Fig. 2 B

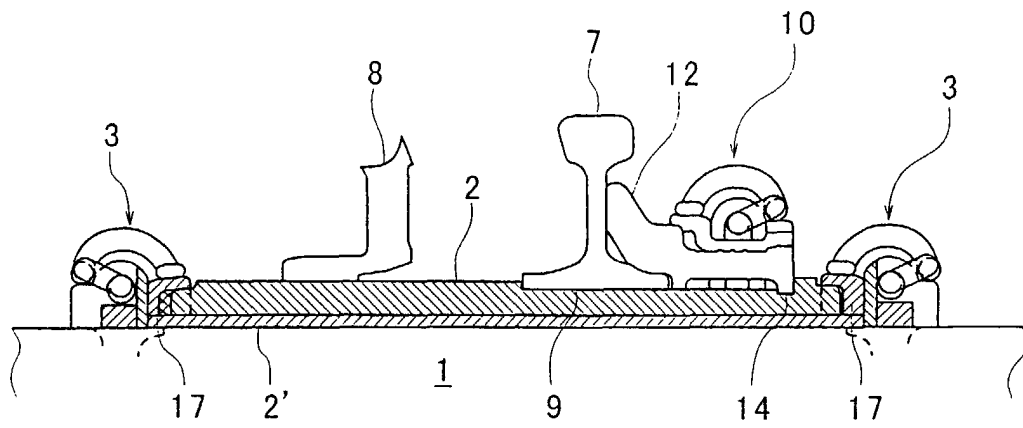


Fig. 3

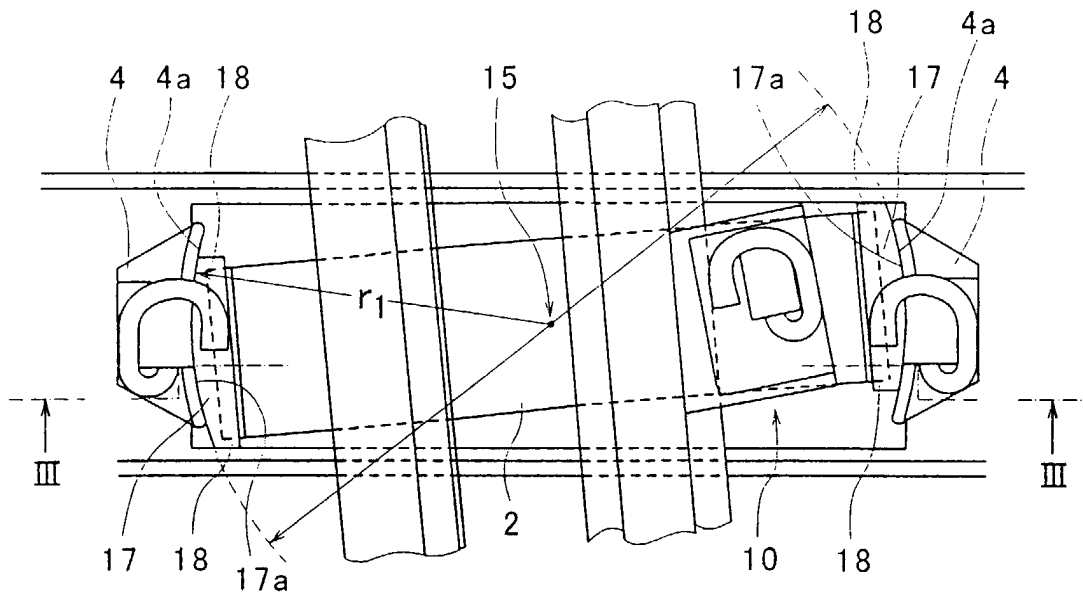


Fig. 4 A



Fig. 4 B

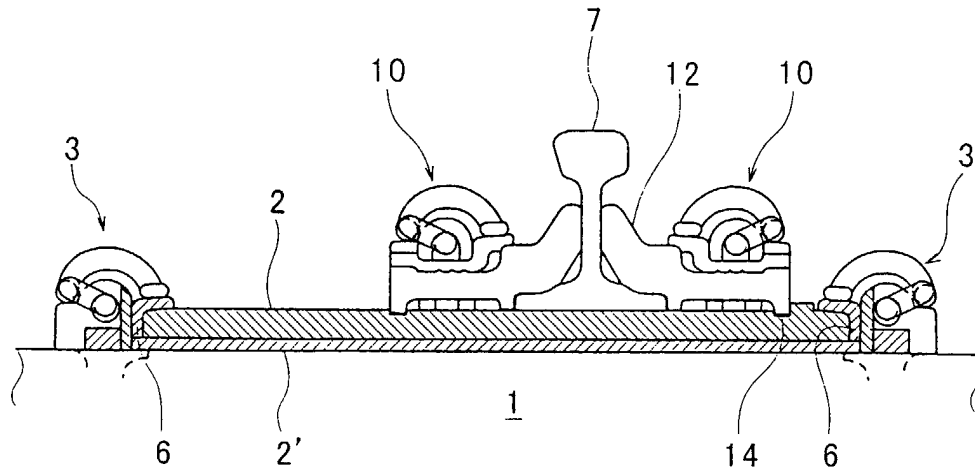


Fig. 5

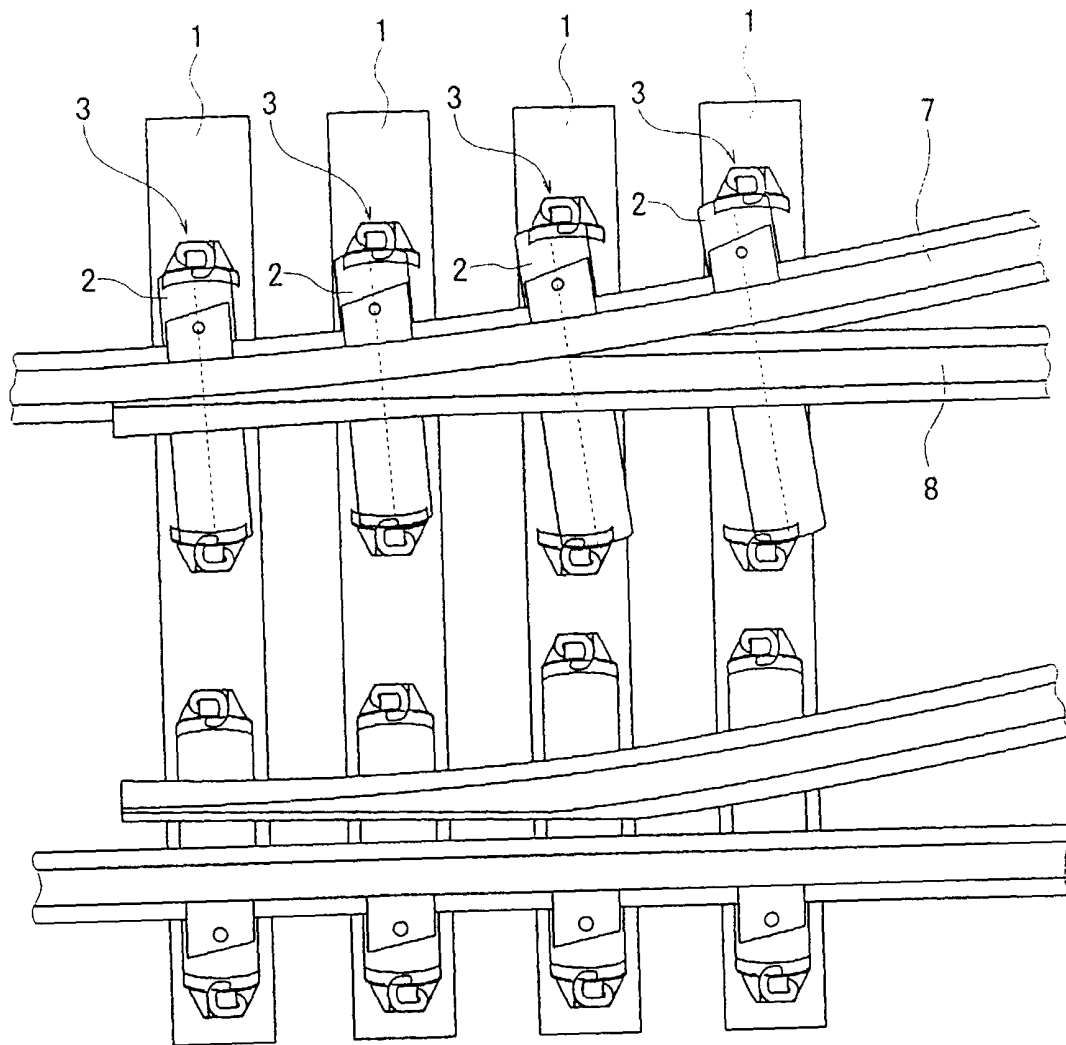


Fig. 6

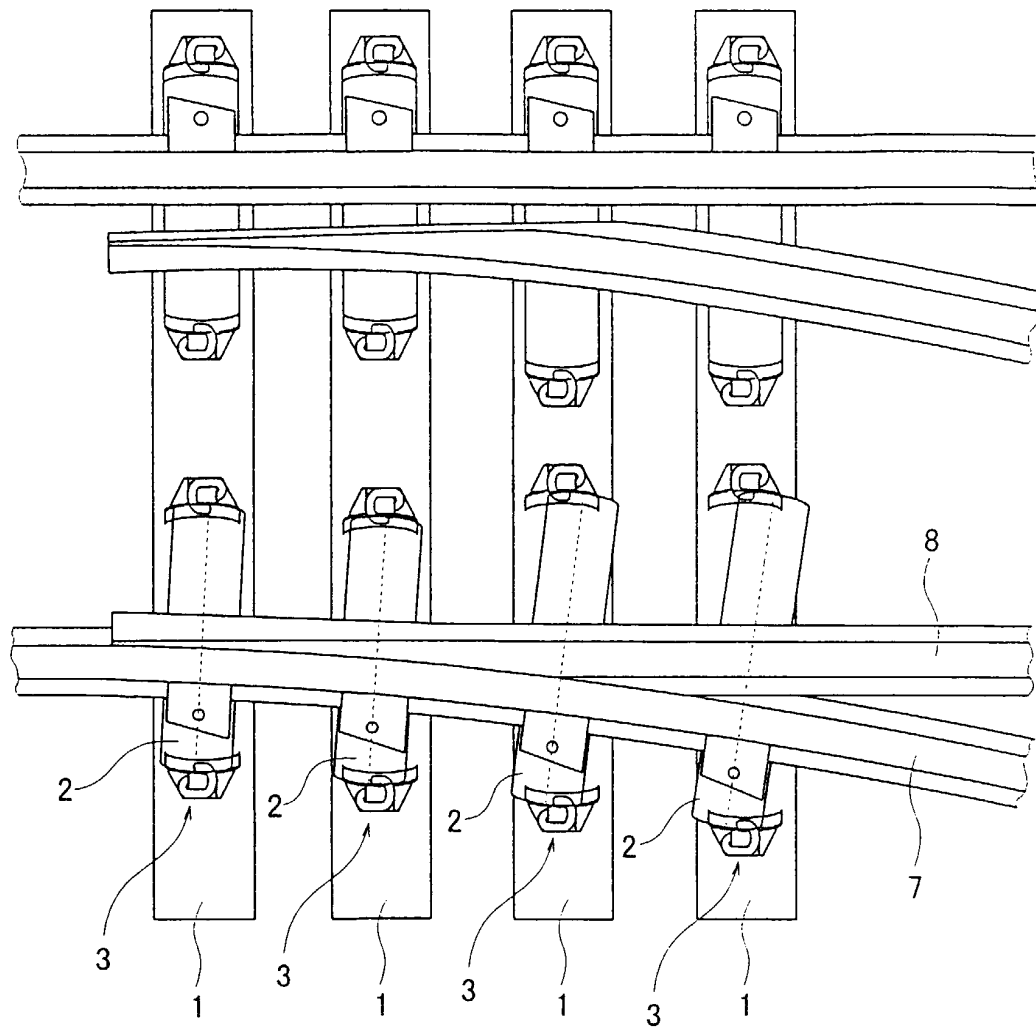


Fig. 7

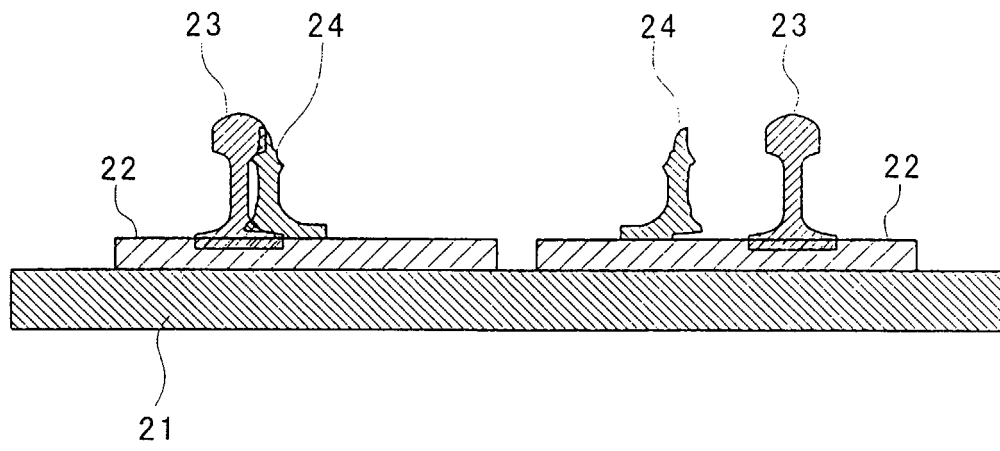


Fig. 8

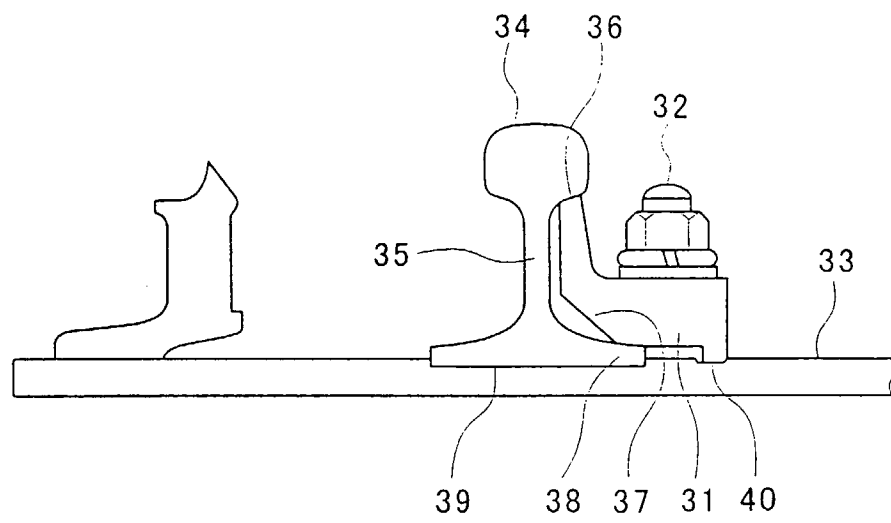


Fig. 9

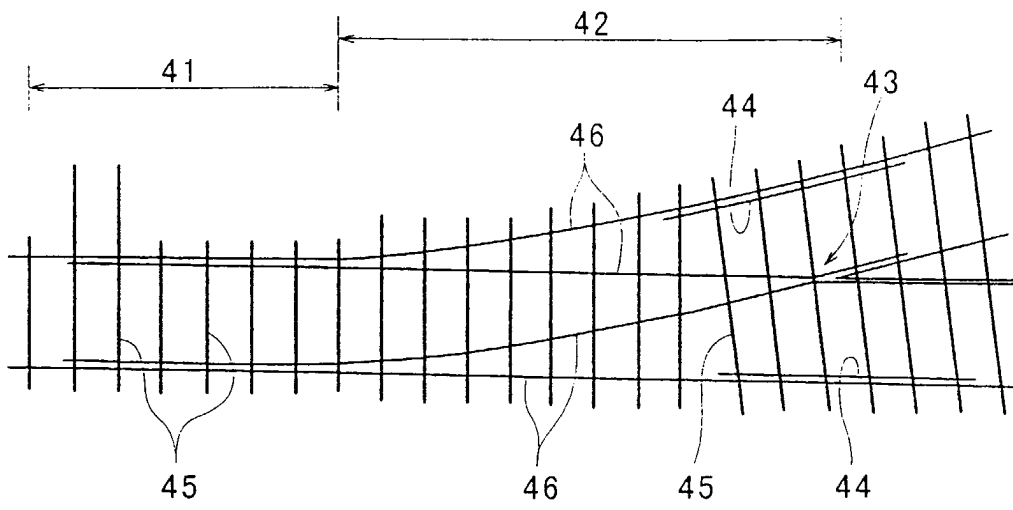


Fig. 1 0

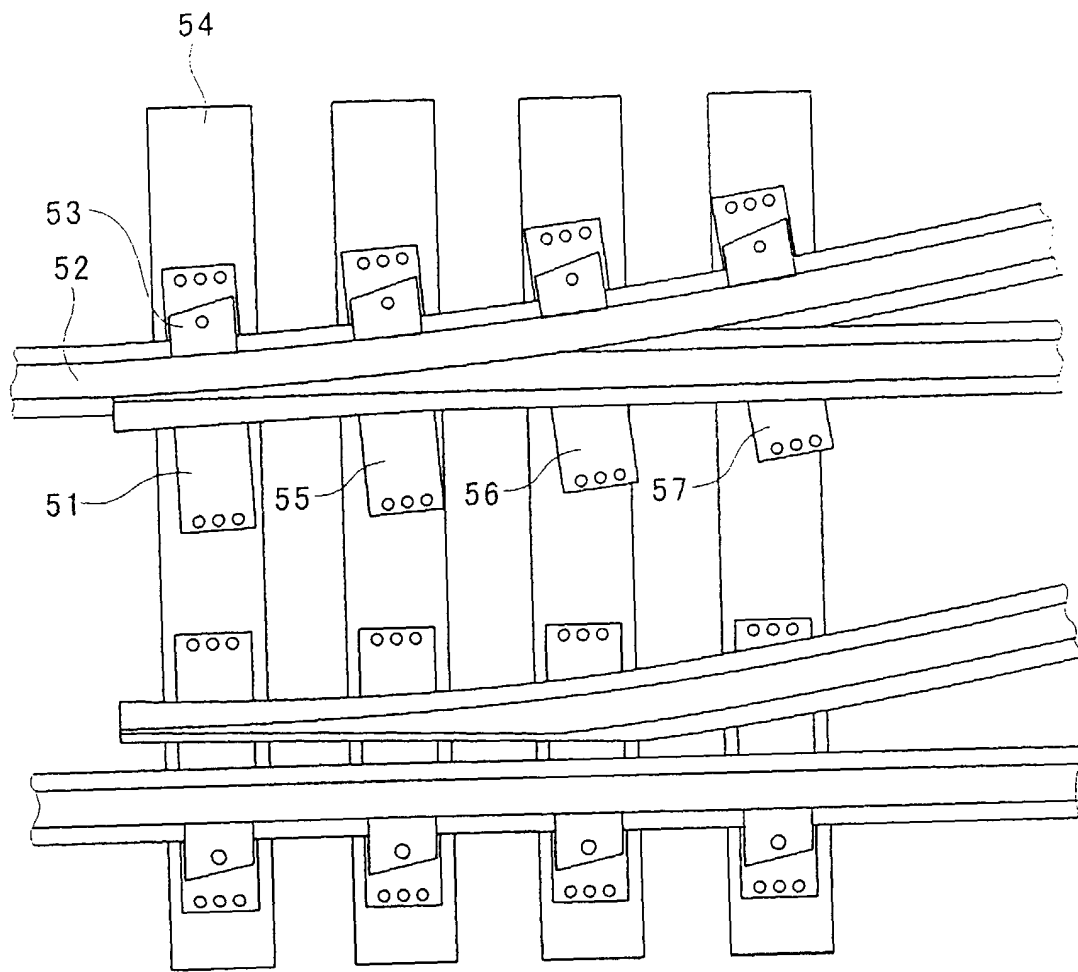


Fig. 1 1

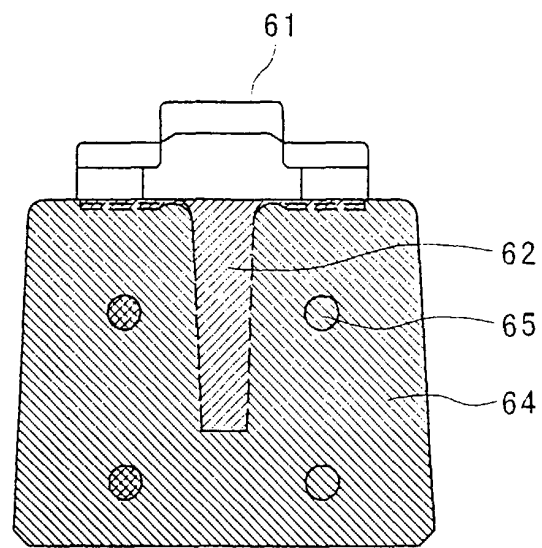


Fig. 1 2 A

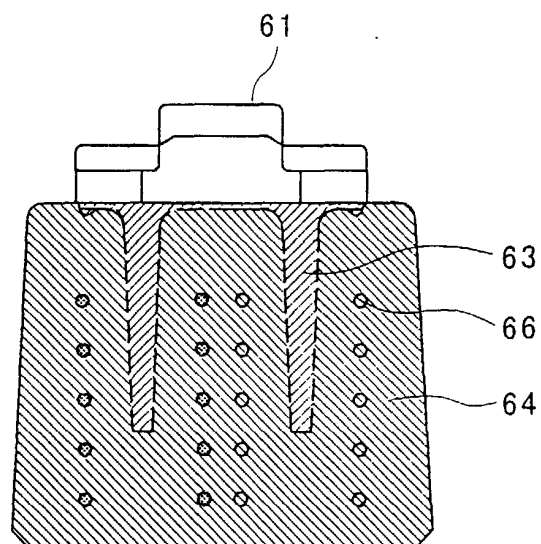


Fig. 1 2 B

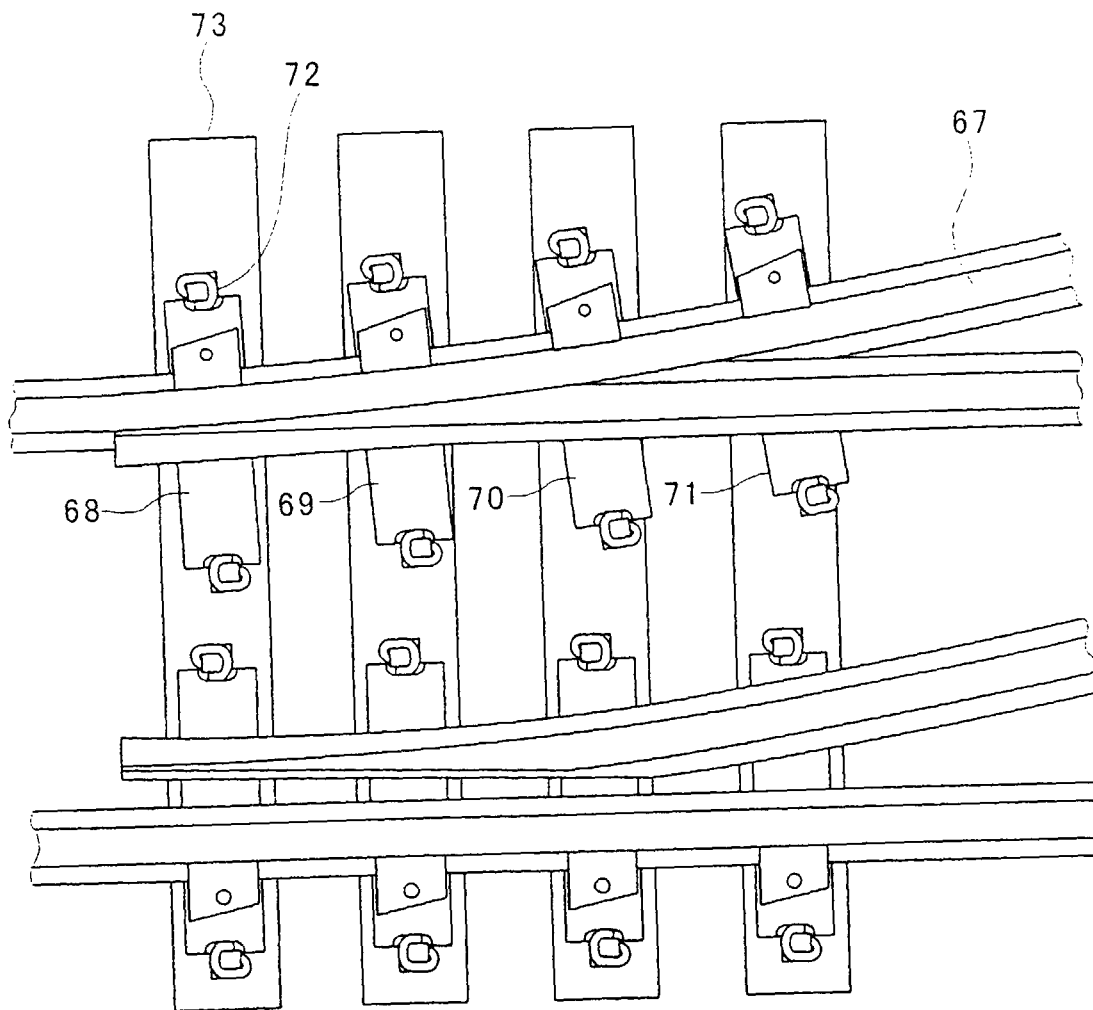


Fig. 1 3

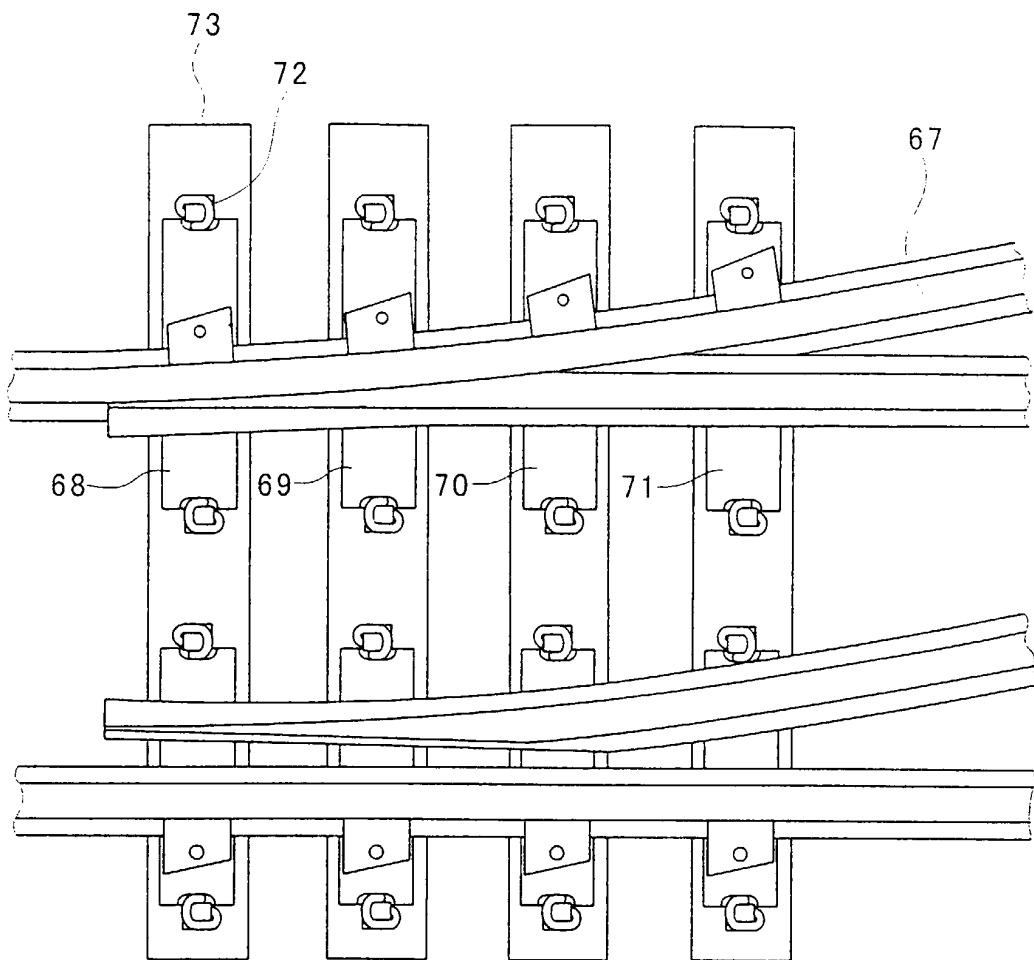


Fig. 1 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 1839

DOCUMENTS CONSIDERED TO BE RELEVANT			
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E01B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31 May 2000	Examiner Blommaert, S
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EPO FORM 1503 03.92 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 30 1839

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