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(54) Railway point with flexible tongue

(57) Acute swing nose crossing comprising a fixed element (1) and a moving element (2), the moving element (2) consisting of a main point (2A) and a counterpoint (2B), the main point (2A) consisting of a front part (2A') and a rear part (2A''). The front part (2A') is made of austenitic manganese steel, for alternate coupling to either side of the fixed element (1) to constitute with

them a continuous rolling path. The rear part (2A'') is made of a machined rail section and is joined to the front part (2A') by a special flash butt welding technique. The counterpoint (2B) is made of machined rail and is integrally joined to the main point (2A) by bolted unions so that the counterpoint (2B) follows the sideways motion of the main point (2A) and is perfectly coupled to it in order to form a continuous rolling path.

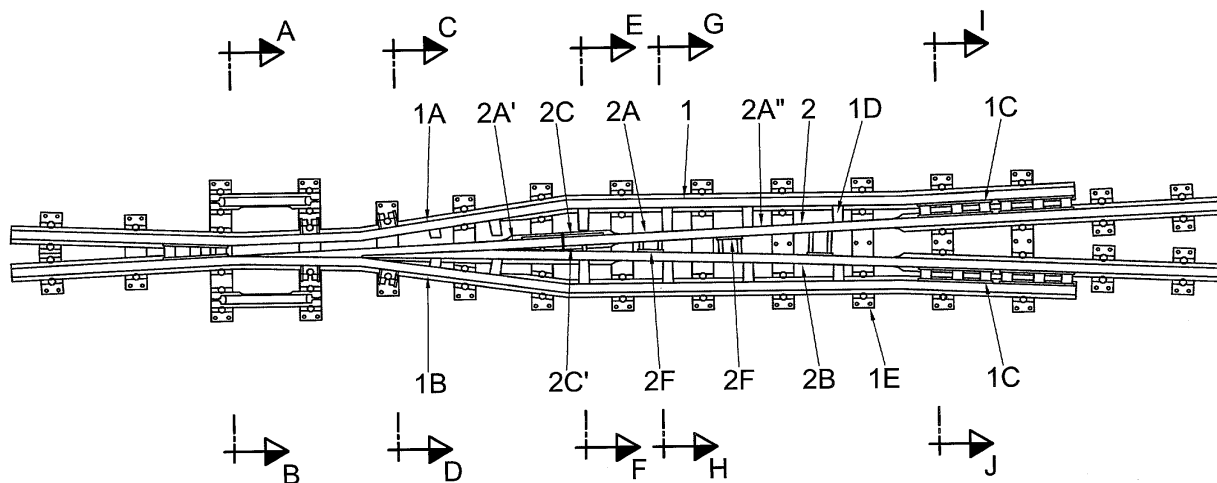


FIG.1

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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to an acute swing nose crossing with improved elements on the rolling surface, of application to both assembled swing nose crossings and in swing nose crossings with monoblock elements, based on the construction of all or part of the elements with rolling surface in austenitic manganese steel.

[0002] The improvements relate in particular to acute crossings in which the moving element consists of a main nose and a counter-nose joined to the main nose and moving with it in its sideways motion.

BACKGROUND OF THE INVENTION

[0003] The crossing is the part of the railway where two tracks cross each other, and it must allow traffic to pass on both lines of the track without any restriction.

[0004] Crossings can be divided into those with fixed noses and those with swing noses, the latter having the advantage of eliminating the gap or interruption on the rolling surface required in fixed-nose crossings to allow the railway wheel flanges to pass.

[0005] The acute swing nose crossing comprises a fixed part and a moving part, the moving part being alternately coupled to either side of the fixed part to allow the railway wheel to pass on one or the other rail, constituting a continuous rolling surface. In this way check rails to guide the railway axles through the fixed-nose crossing gap are no longer necessary.

[0006] There are various types of acute swing nose crossings, according to their form of construction, which can be classified in two main groups:

- Assembled acute swing nose crossings. In these crossings, the fixed element consists of rail sections or the like in the rolling path, the sections being preferably joined by brackets and bolts or by clips to a set of plates which are in turn joined to the sleepers by screwspikes. The moving element is made of machined carbon steel rails or forged elements of the same material. In order to improve the wear characteristics in the rolling areas, these areas are often subjected to hardening heat treatments.
- Acute swing nose crossings with monoblock elements. In this case, at the contact area with the railway wheel the fixed element consists of a monoblock case made of cast steel, preferably austenitic manganese steel. The moving element can be partly made of austenitic manganese steel.

[0007] Traditionally, the elements with rolling surfaces of the crossing, both of the fixed and moving element, have been made of steel of natural hardness or of steel, hardened by a heat treatment, the latter case providing

a better wear resistance as the hardness of the rolling area is above 300 HBN.

[0008] However, this heat treatment is superficial and has been performed on a carbon steel or a weakly alloyed steel, so that it has the following disadvantages:

- The hardened surface layer is not regenerated and is lost as wear develops in the wheel contact area.
- The base material of the elements with rolling surface is not easily repairable on track by built-up welding, as the carbon content and/or its alloy elements require a preheating of the material that is not easily realised on track.

[0009] The use of austenitic manganese steel is also known, as these show an excellent compromise between the impact and wear resistance.

[0010] Austenitic manganese steel shows a marked phenomenon of surface hardening by cold plastic deformation as the train wheels pass, so that an extremely hard surface layer develops on its surface, suitable to resist the wear yet maintaining great ductility of its core so that it can withstand impact loads and resist crack propagation.

[0011] The same applicant holds PCT application WO97/41305 relating to an acute swing nose crossing for railways, that consists of a fixed and a moving element, with the property that the front triangular area of the moving element is made of cast manganese steel, having behind it two prolongations made of rails. The triangle and the rail prolongations are joined to each other by flash butt welding. This welding process is described for example in European Patent n° 0 467 881 and others. The fixed part consists of a part made of cast manganese steel and a part made of rails that act as anchoring for several accessories, and as a coupling means for the moving element on either side of the fixed element. The elements made of manganese steel are hardened by explosive hardening to an approximate hardness of 350 HBN.

DESCRIPTION OF THE INVENTION

[0012] The acute swing crossing object of the invention consists of a main point and a counterpoint, with the property that the main point is formed by two parts, a front part and a rear part, the front part, which is alternately coupled to either side of the fixed element, being made of austenitic manganese steel, while the rear part being made of machined rail.

[0013] The rear part made of a machined rail and the front part made of manganese steel are joined to each other by the aforementioned flash butt welding technique, reinforcing the joint of the parts by safety fish-plates so that the main point will mainly bend at the rear part.

[0014] The counterpoint is made of rail and is integrally joined to the main point by bolted unions, so that the

counterpoint follows the sideways motion of the main point when the moving element is in operation.

[0015] The object is to make all or part of the elements with rolling surfaces of the acute swing nose crossing of austenitic manganese steel, which provides a number of advantages over those made of carbon steel, low alloyed carbon steels of natural hardness or carbon steels with surface hardening by a heat treatment:

- When installed on track, the material has a moderate natural hardness (around 200 HBN) so that, during the first moments of working, the material undergoes plastic deformations in the contact area with the railway wheels that induce a surface hardening of up to 500 HBN.
- The hardened surface layer is regenerated as the train wheels pass, so that the wear produced by these does not remove it, instead it remains throughout the entire life of the crossing.
- It is easily repaired on track by built-up welding as it does not require a preheating. Using electrodes of similar material, the repaired area recovers the working hardness (500 HBN) upon passage of the train wheels. This implies a great advantage for repairs required due to wear, derailing, dents made by foreign objects, etc.

[0016] In addition, a pre-hardening by explosion or an analogous plastic deformation can be performed on the rolling surfaces of the elements made of austenitic manganese steel, conferring an initial hardness to the material between 320 and 350 HBN, limiting the initial plastic deformation induced by the contact of railway wheels. This pre-hardening increases the life of the component and contributes to maintain the geometry of the rolling area throughout the service life of the component.

DESCRIPTION OF THE DRAWINGS

[0017] To complement the description being made and in order to aid a better understanding of the characteristics of the invention, in accordance with an example of a preferred practical embodiment of the invention, a set of drawings is accompanied as an integral part of the description where for purposes of illustration only and in a non-limiting sense the following is shown:

Figure 1 shows a plan view of a preferred embodiment of the acute swing nose crossing object of the invention, giving passage to the circulation by main line, considering that this crossing is integrated in a right hand side single turnout.

Figure 2 shows a plan view of the acute swing nose crossing shown in the previous figure giving passage to the circulation along the branch line of the turnout.

Figure 3 shows a plan view of the acute swing nose crossing object of the present invention in a second embodiment of the fixed element, giving passage to the circulation by main line, considering that the crossing is integrated in a right hand side single turnout.

The configuration of the crossing giving passage to the circulation along the branch line would be analogous to that shown, with the moving element in a position similar to that shown in Figure 2.

Figure 4 shows a plan view of the acute crossing object of the invention in a third embodiment of the fixed element, in which it is constructed as a monoblock piece, giving passage to the circulation by the main line, considering the crossing to be integrated in a right hand side single turnout.

The configuration of the crossing giving passage by the branch line will be analogous to the one shown with the moving element in a position similar to that shown in Figure 2.

Figure 5 shows a section view of the acute crossing represented in figures 1 and 3 along the line AB.

Figure 6.- Shows a section view of the acute crossing represented in figures 1 and 3 along the line CD.

Figure 7.- Shows a section view of the acute crossing represented in figures 1 and 3 along the line EF.

Figure 8.- Shows a section view of the acute crossing represented in figures 1 and 3 along the line GH.

Figure 9.- Shows a section view of the acute crossing represented in figures 1 and 3 along the line IJ.

Figure 10.- shows a section view of the acute crossing represented in figure 4 along the line AB.

Figure 11.- shows a section view of the acute crossing represented in figure 4 along the line CD.

Figure 12.- shows a section view of the acute crossing represented in figure 2 along the line AB.

PREFERRED EMBODIMENT OF THE INVENTION

[0018] As shown in figures 1 and 2, the acute swing nose crossing object of the invention comprises a fixed element (1) and a moving element (2), the moving element (2) being composed of a main point (2A) and a counterpoint (2B). The front part of the main point (2A) is alternatively coupled to the two parts made of rail (1A) and (1B) of the fixed element (1), this displacement being performed by electromechanical elements, not shown in the figures, alternately giving passage by the main line, as shown in figure 1, or to the branch line, as

shown in figure 2, closing the crossing gap and constituting a continuous rolling surface.

[0019] The main point (2A) consists of two parts (2A') and (2A''), with the property that the front part (2A') is made of austenitic manganese steel and it is the part that is alternately coupled to the two parts of the rail of the fixed element (1A) and (1B) in order to constitute with them a continuous rolling surface.

[0020] The rear part (2A'') is made of machined rail that is joined to the fixed part (1) by heel blocks (1C).

[0021] The front part (2A') of the main point (2A) is welded by flash butt welding to the rear part (2A'') of the main point (2A), made of machined rail, which is meant to establish continuity of the rolling surface of the main track, to absorb the elastic deformations during the sideways movement of the main point and to join this main point to the fixed element (1A), by means of heel blocks (1C). So that the elastic deformations are not transmitted to the welding between the front part (2A') and the rear part (2A'') of the main point (2A) the welding is reinforced with two fishplates (2C) and (2C') on either side of it.

[0022] The counterpoint (2B) is made of machined rail and is integrally joined to the main point (2A), accompanying it in its sideways motion, so that it is perfectly coupled at the side of the main point, forming with it a continuous rolling surface to allow, when required and according to the crossing geometry, a longitudinal sliding of the main point (2A) and the counterpoint (2B), by making grooved holes in one of the two parts (2A) or (2B) of the moving element and using an elastic bolted union between them to prevent the moving element (2) from forming a non-deformable triangle in its transverse motion.

[0023] The purpose of the counterpoint is to provide continuity to the rolling surface in the branch line, to absorb elastic deformation during the sideways motion of the main point and to serve as a union element between the main point and the fixed element rail part (1B) by means of the corresponding heel blocks (1C).

[0024] The union of the moving elements, the point (2A) and the counterpoint (2B) with the rail parts (1A) and (1B) of the fixed element by the heel blocks (1C) ensure the transmission of longitudinal forces due to the heat expansion of the main line and the branch line, without significant relative displacements between the fixed element (1) and the moving element (2).

[0025] The moving element is completed by inner distance blocks (2F) that are alternately bolted to the main point (2A) and to the counterpoint (2B) so that the two maintain relative separations determined by the crossing geometry.

[0026] In this way, the acute swing nose crossing object of the Patent can be incorporated to a continuous welded track.

[0027] Described below are three preferred embodiments of the fixed element, respectively represented in figures 1, 3 and 4.

[0028] In the preferred embodiment shown in figures 1 and 2, the fixed element consists of two rail sections (1A) and (1B), the contact with the railway wheel occurring on its front part, while its rear part acts as a support for heel blocks (1C), distance blocks (1D) and base plates (1E), together forming a unit joined by brackets, bolted unions and elastic clips.

[0029] In a second embodiment shown in figure 3, the two rail parts (1A) and (1B) are made of austenitic manganese steel, so that in the area where rolling contact occurs the wheel always rests on austenitic manganese steel. To allow the thermit welding of the fixed element rail parts (1A) and (1B) to the rails of the intermediate panel of the railway turnout, the parts (1A) and (1B) are welded to two rails of carbon steel or of low alloyed steels (1A') and (1B'), by a special flash butt welding technique, these rails (1A') and (1B') joining it to the track with a continuous welded rail.

[0030] In a third embodiment shown in Figure 4, the fixed element (1) consists of a monoblock case (1F), moulded in austenitic manganese steel, and of two rail parts (1A) and (1B) that act as anchoring for accessories such as distance blocks (1D), heel blocks (1C) or sliding plates (1E), the moulded case (1F) being joined by its front part to two rails of carbon steel or low alloyed steels (1A') and (1B') by a flash butt welding technique that allow their union by thermit welding to the rails of the railway turnout intermediate panel.

[0031] Both the rails of the rear part (1A) and (1B) and those of the front part (1A') and (1B') are welded to the moulded case (1F) by a flash butt welding technique.

[0032] The upper surfaces of the moulded case (1F) of the fixed element are moulded analogously to the rail profiles (1A) and (1B), thereby allowing the train wheels to pass and the alternate coupling of the moving element to give way to the main or branch line.

[0033] All of the described embodiments improve the performance of the elements or parts made of austenitic manganese steel subjecting them, in the areas in contact with the wheels, to a surface hardening process by explosion or analogous plastic deformation, conferring to the surface an initial hardness of 320 to 350 HBN, thereby limiting the initial plastic deformation of the rolling surface and thus increasing the lifetime of the component.

Claims

1. Acute swing nose crossing for railways with improved elements on the rolling surface, composed of a fixed element (1) that incorporates two rails (1A) and (1B) and of a moving element (2) comprising a main point (2A), that is alternately coupled to either side of the fixed element to constitute a continuous rolling track, and a counterpoint (2B), **characterised in that** the main point (2A) consists of two parts, a front part (2A') made of austenitic manga-

nese steel and a rear part (2A'') made of machined rail, the two parts (2A') and (2A'') joined by flash butt welding, being the welding reinforced between the two parts (2A') and (2A'') by safety fishplates (2C) and (2C') so that the main point (2A) mainly bends at the rear part (2A''), the counterpoint (2B) being made of machined rail and integrally joined to the main point (2A) by bolted unions, so that the counterpoint (2B) follows the sideways motion of the main point (2A) when performing the manoeuvre of the moving element (2), the two parts of the moving element (2A) and (2B) being attached to the rails (1A) and (1B) of the fixed element by heel blocks (1C) defining a hingeless joint.

2. Acute swing nose crossing for railways with improved elements on the rolling surface, according to claim 1, **characterised in that** the fixed element consists of two rail parts or elements (1A) and (1B), the railway wheel making contact with the front part of them, both parts (1A) and (1B) acting as an anchoring support for the heel blocks (1 C) and distance blocks (1D), both being joined to the base plates (1E) by bolted unions, brackets and elastic clips, together forming an assembled unit.

3. Acute swing nose crossing for railways with improved elements on the rolling surface, according to claims 1 and 2, **characterised in that** the rail parts (1A) and (1B) of the fixed element are made of austenitic manganese steel and are joined by their front part to two rails (1A'), (1B'), made of carbon steel or of low alloyed steel, by a flash butt welding technique, such that they can be incorporated to a track with a continuous welded rail by thermit welding.

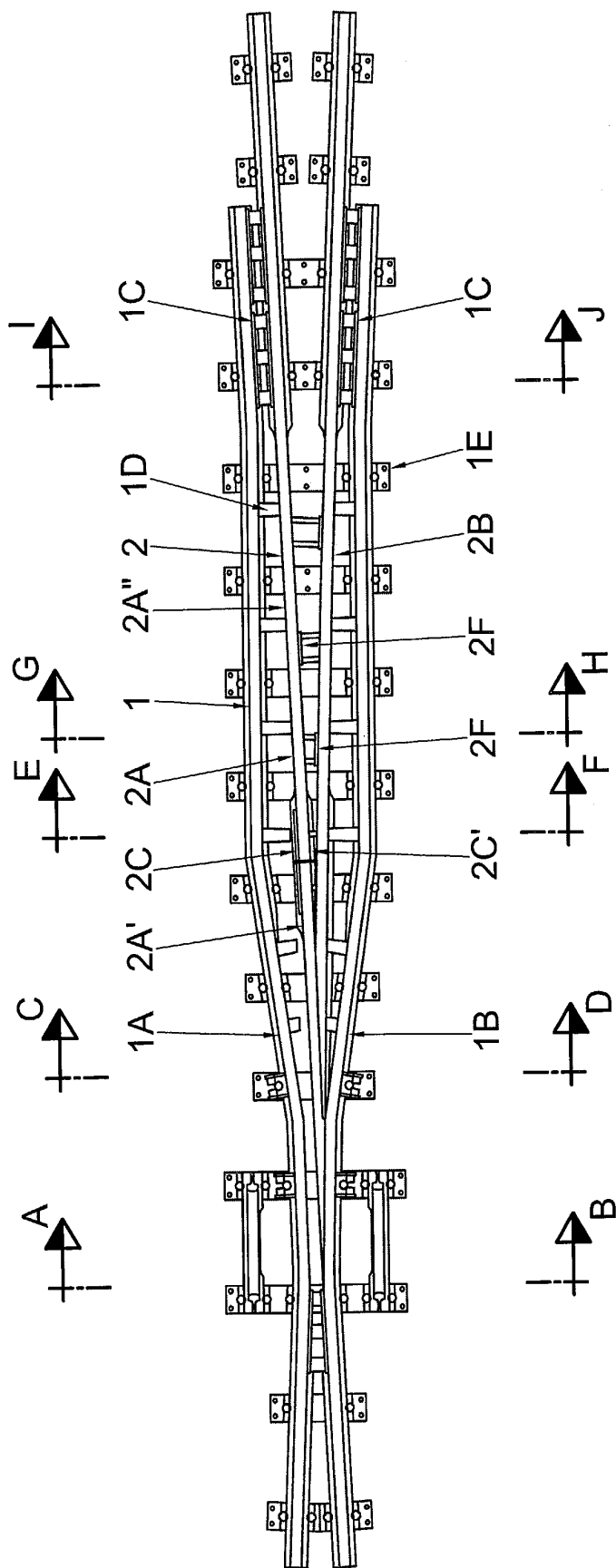
4. Acute swing nose crossing for railways with improved elements on the rolling surface, according to claim 1, **characterised in that** the fixed element (1) consists of a first part comprised of a monoblock case (1F), moulded in austenitic manganese steel, and of a second part made of rails (1A) and (1B) that act as anchoring for accessories such as distance blocks (1 D), heel blocks (1C) or sliding plates (1 E), the monoblock case (1 F) being joined to two front rails (1A') and (1B') that allow connection to a track with a continuous welded rail by thermit welding being the rails of the rear part (1A) and (1B), and those of the front part (1A') and (1B') welded to the monoblock case (1 F) by a flash butt welding technique, the moving element (2) being alternately coupled to either side of the monoblock case (1F) to give way to the main or the branch line.

5. Acute swing nose crossing for railways with improved elements on the rolling surface, according to claim 1, **characterised in that** the contact sur-

face with the railway wheels of the front part (2A') of the main point (2A), made of austenitic manganese steel, is pre-hardened by explosion or analogous plastic deformation to a hardness between approximately 320 and 350 HBN in order to increase its service lifetime.

6. Acute swing nose crossing for railways with improved elements on the rolling surface, according to claims 1 and 3, **characterised in that** the contact surface with the railway wheels of the front part (2A') of the main point (2A), made of austenitic manganese steel, and the rail parts (1A) and (1B) of the fixed element (1), made of austenitic manganese steel, are pre-hardened by explosion or analogous plastic deformation to hardness between approximately 320 and 350 HBN in order to increase its service lifetime.

7. Acute swing nose crossing for railways with improved elements on the rolling surface, according to claims 1 and 4, **characterised in that** the contact surface with the railway wheels of the front part (2A') of the main point (2A), made of austenitic manganese steel, and the monoblock case (1 F) of the fixed element (1), made of austenitic manganese steel, are pre-hardened by explosion or analogous plastic deformation to a hardness level between approximately 320 and 350 HBN in order to increase its service lifetime.



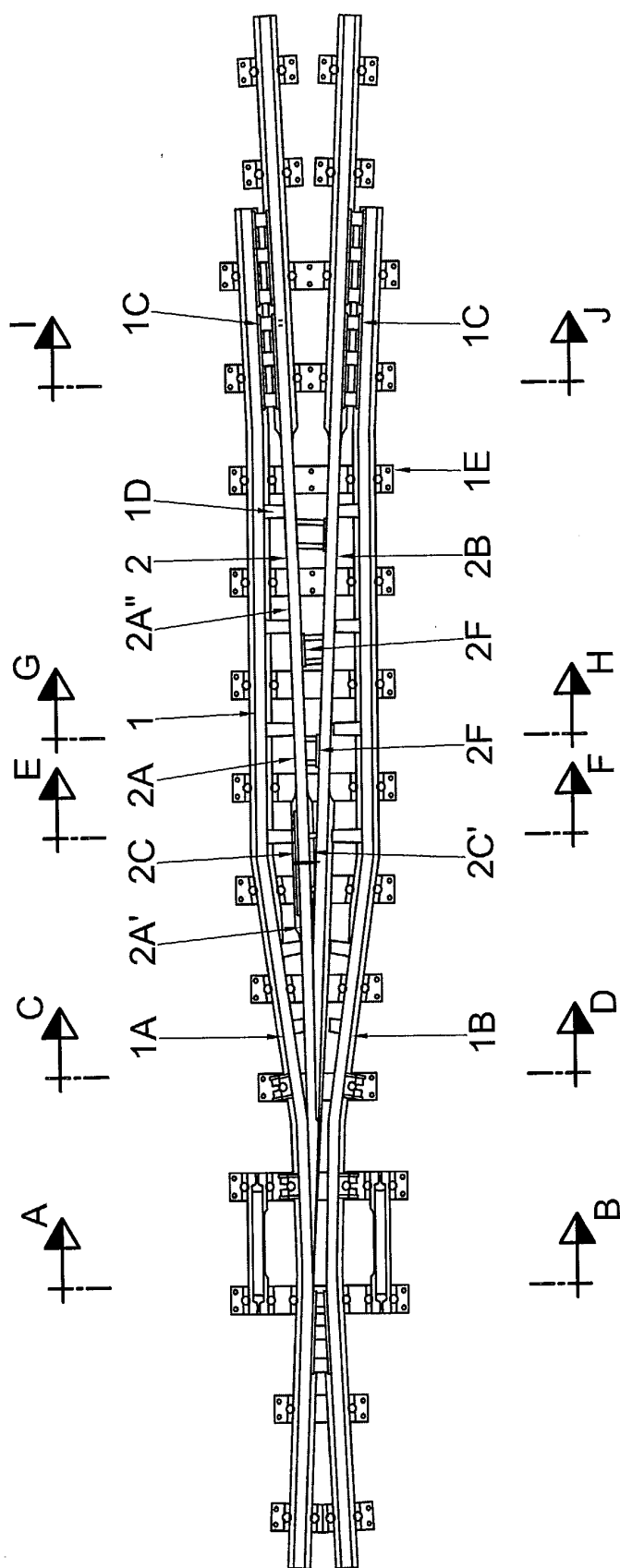


FIG.2

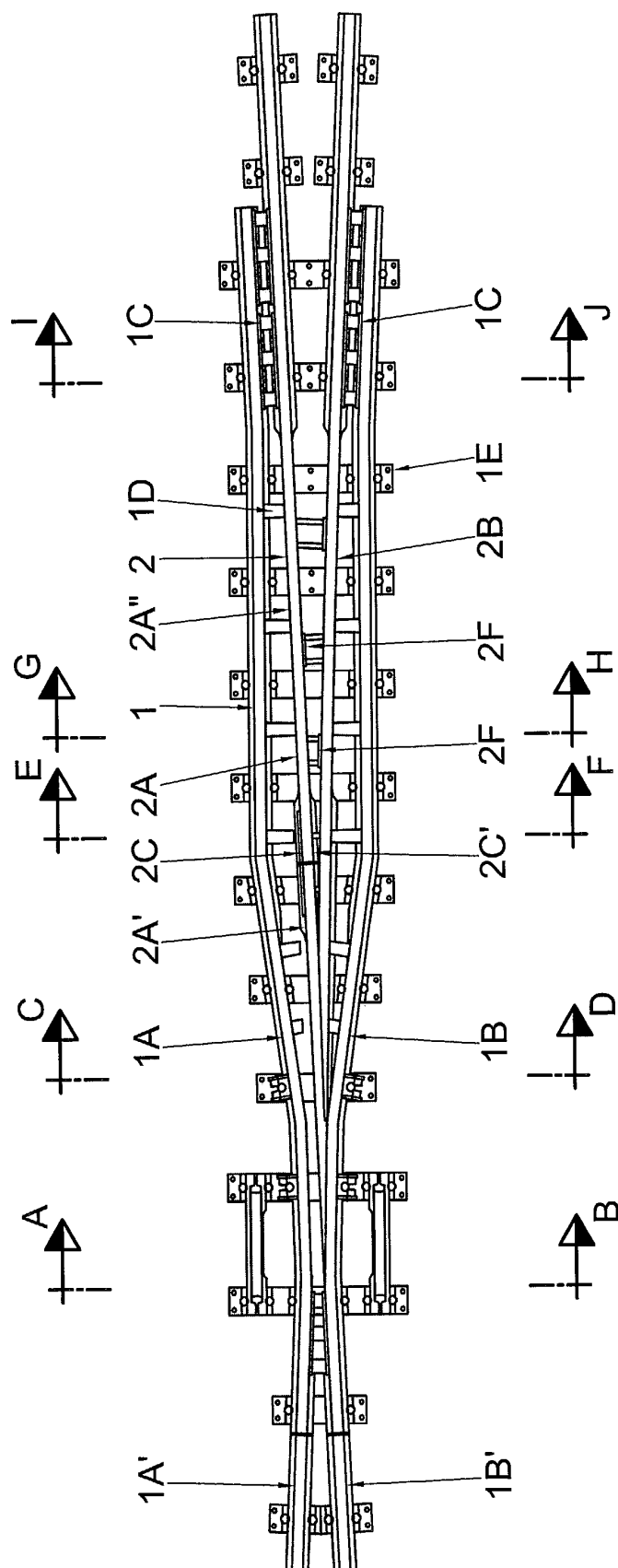
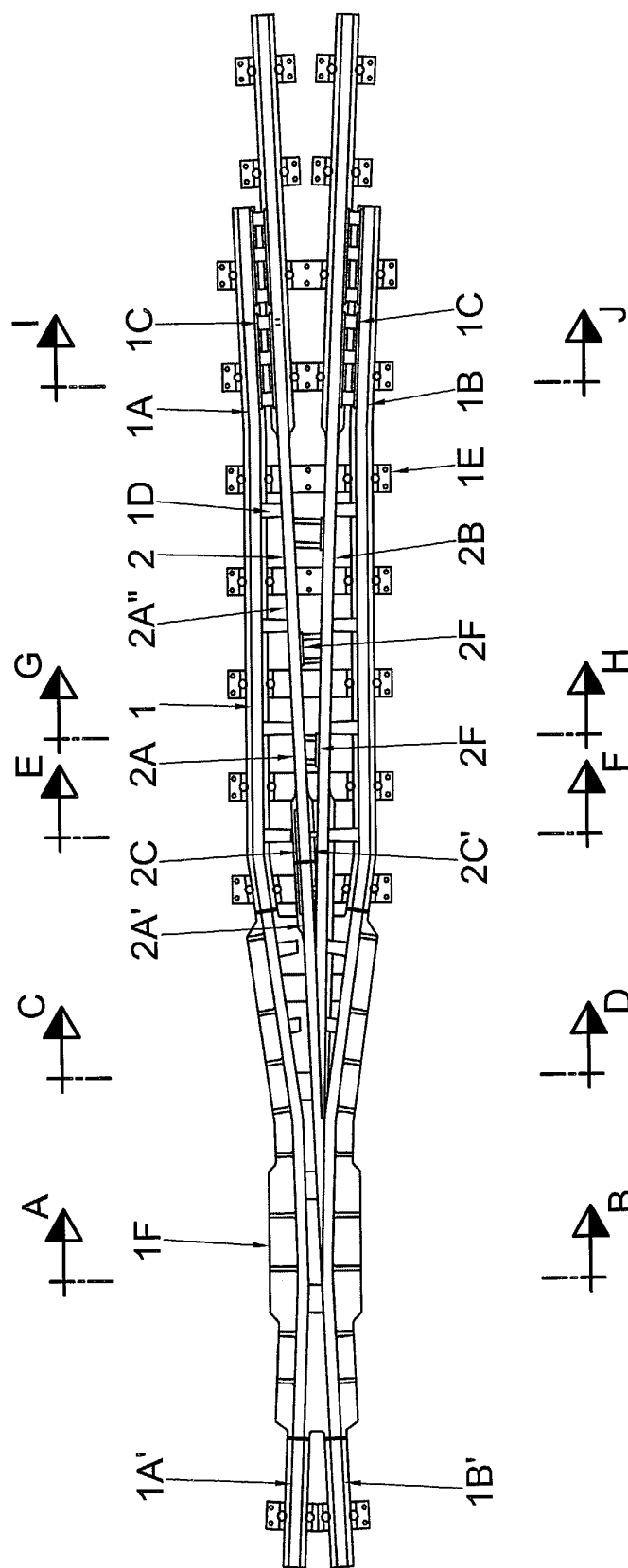


FIG.3



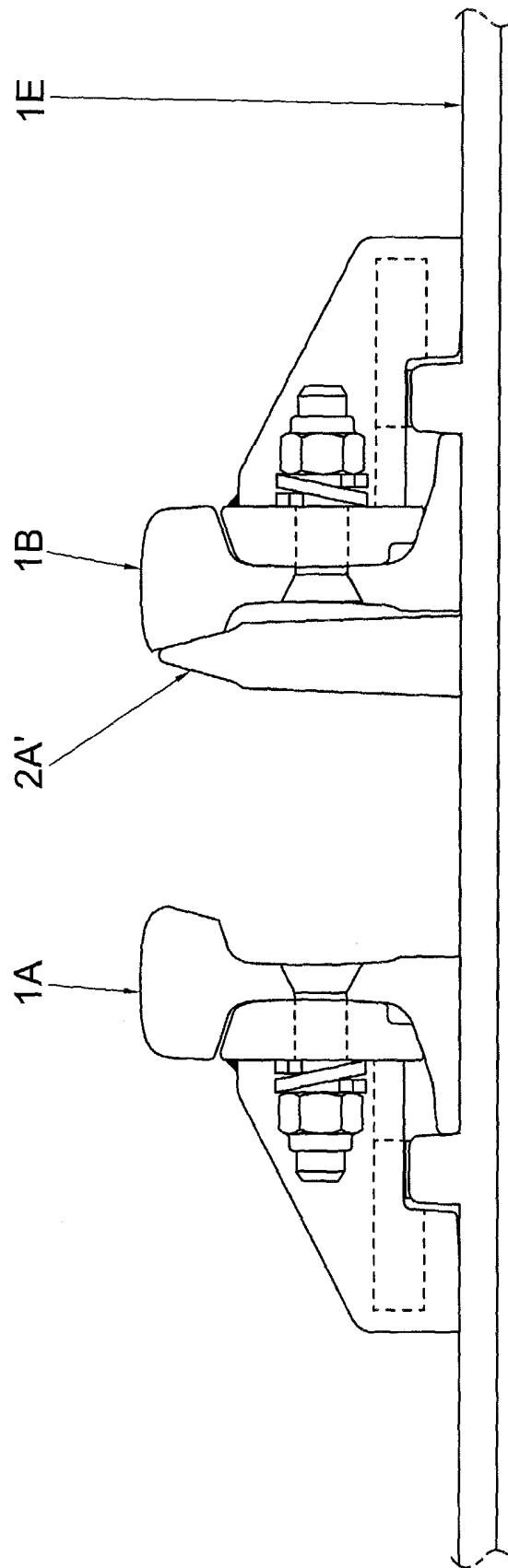


FIG. 5
A-B

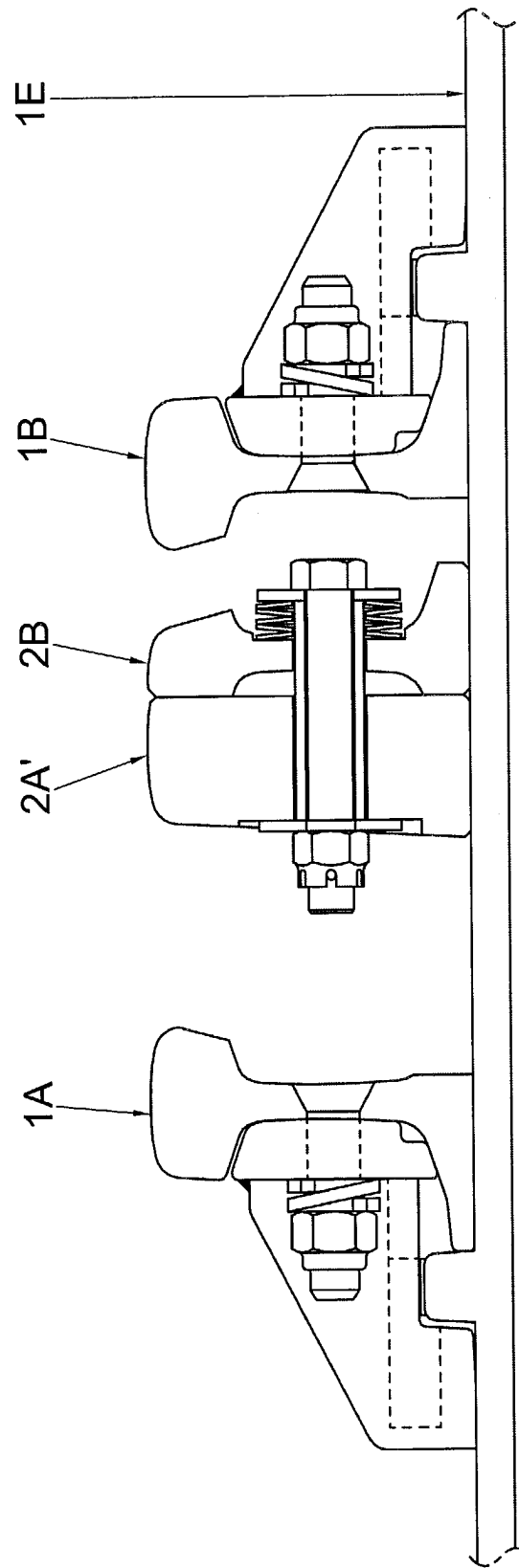


FIG. 6
C-D

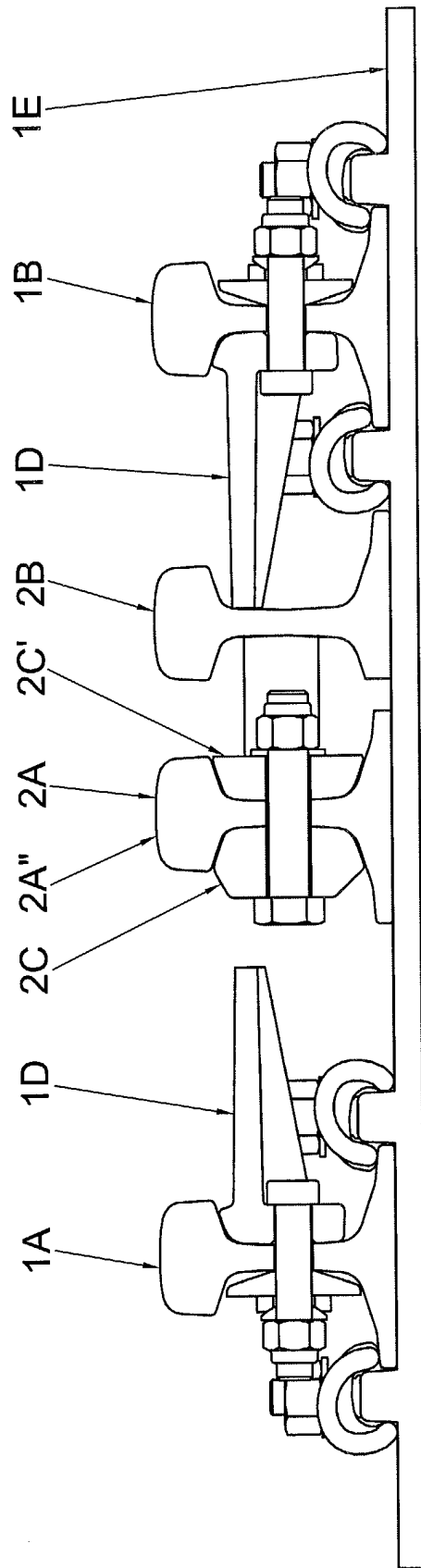


FIG. 7
E-F

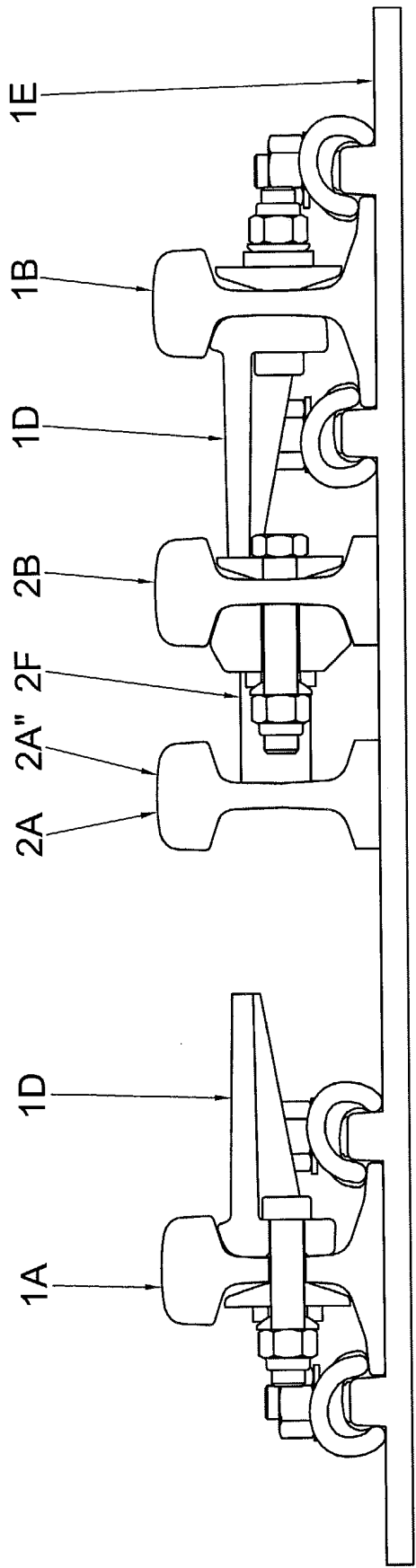


FIG.8
G-H

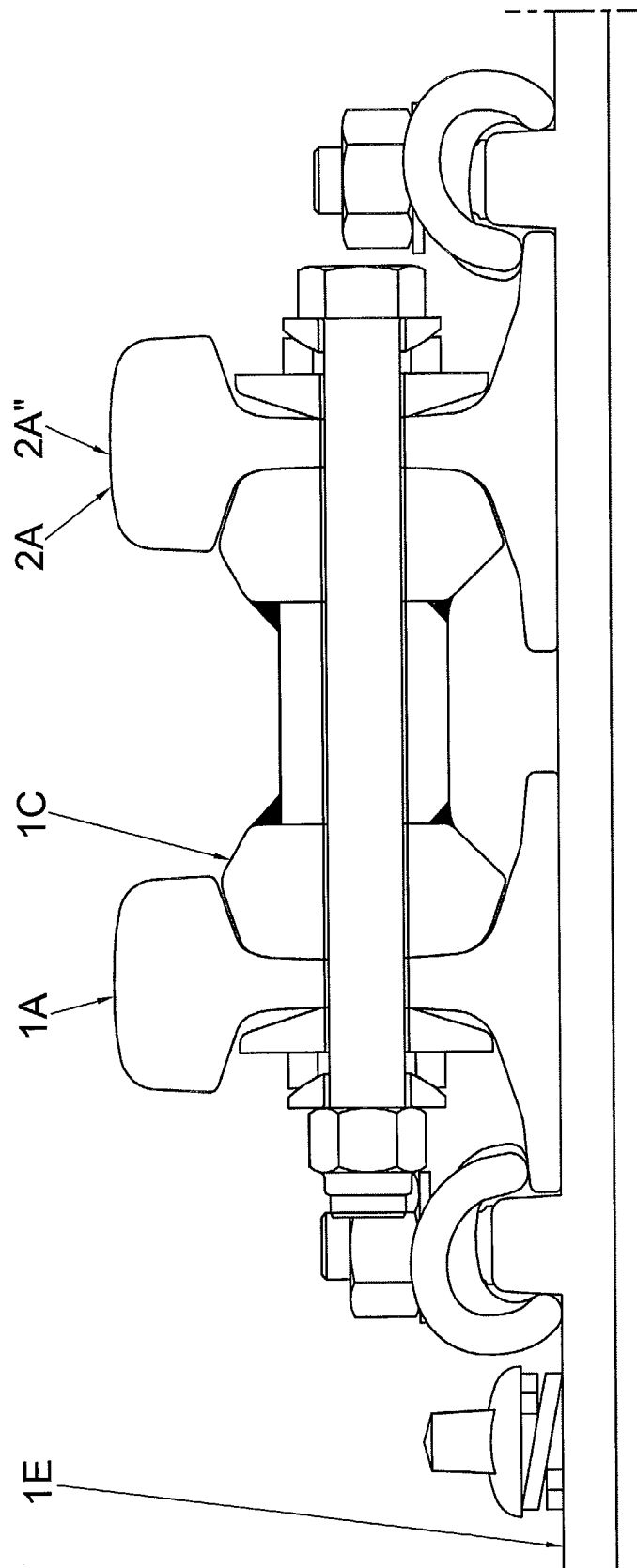


FIG.9
I-J

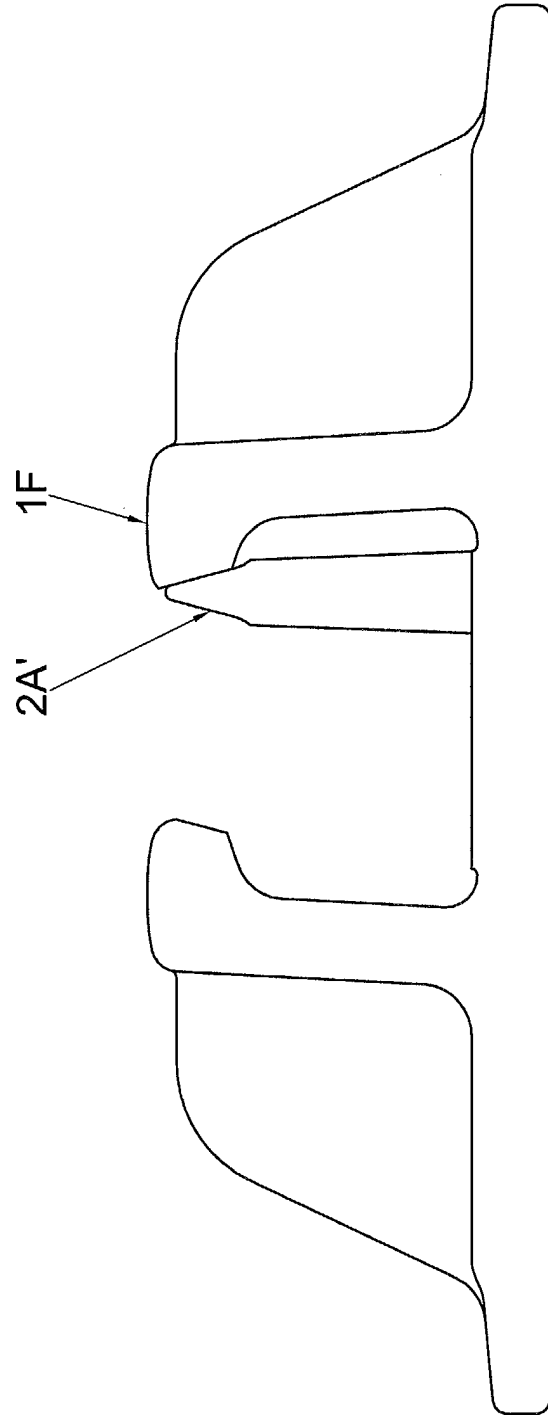


FIG.10
A-B

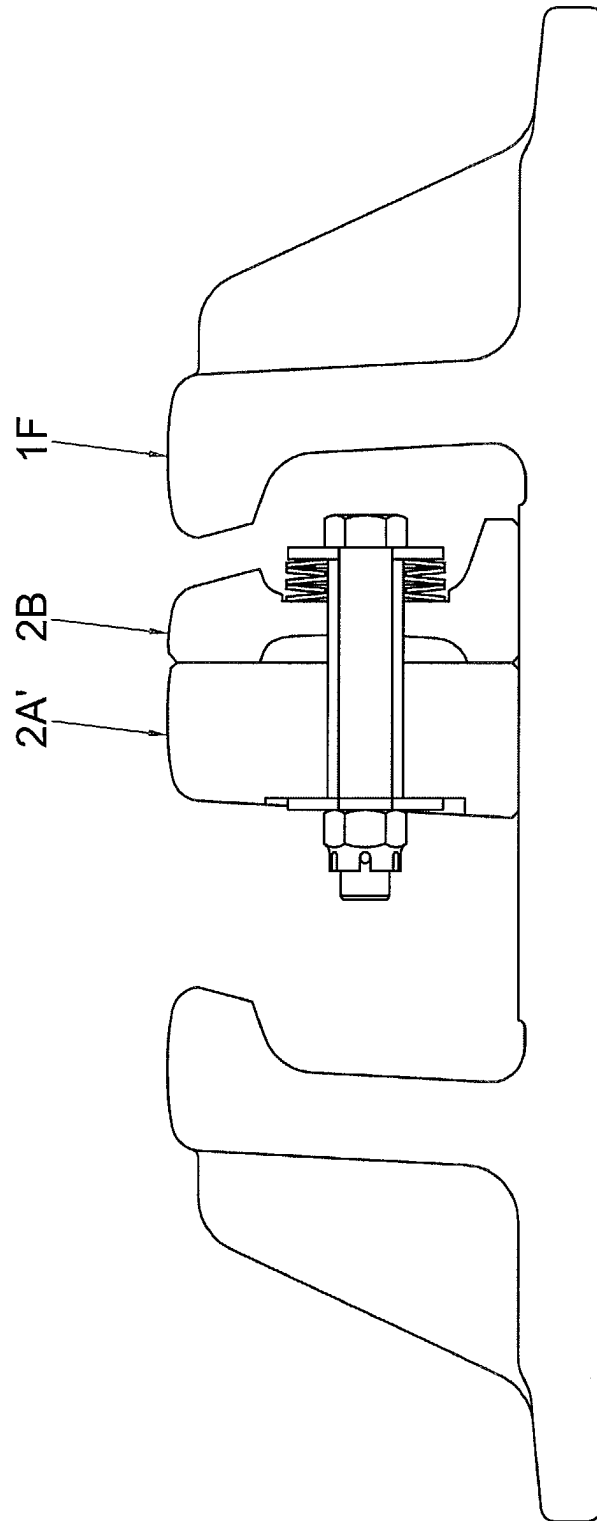


FIG.11
C-D

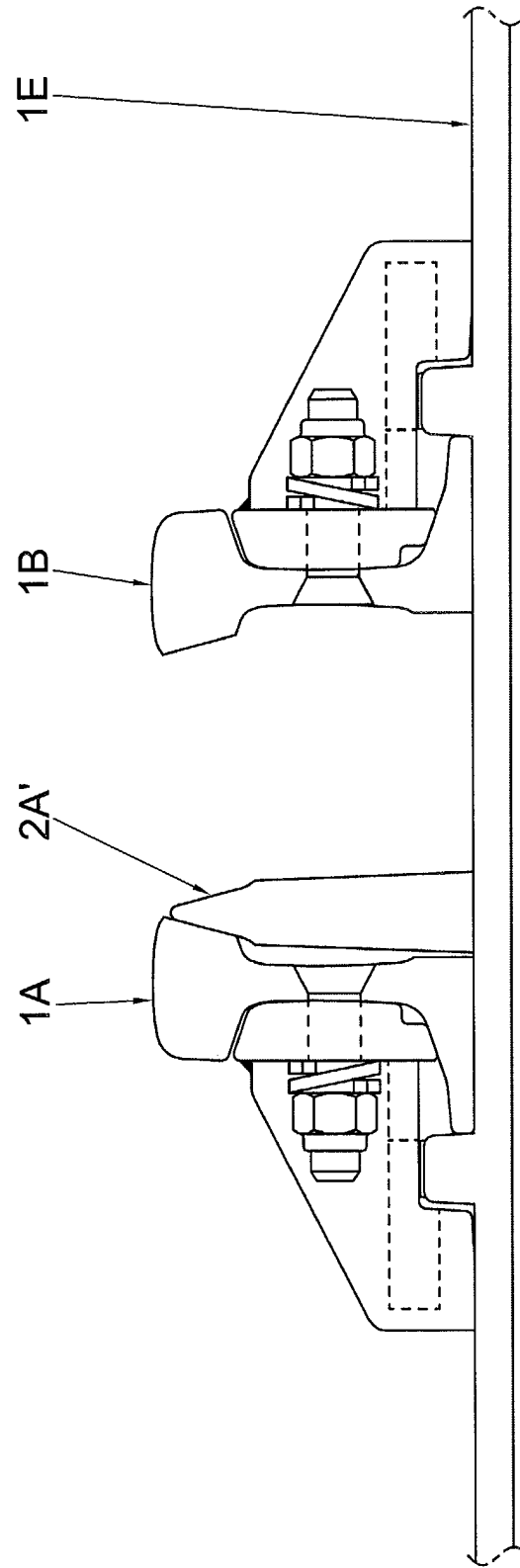


FIG. 12
A-B



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 38 0012

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Place of search THE HAGUE		Date of completion of the search 17 June 2004	Examiner Kergueno, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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