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(54) ACUTE CROSSING OF RAILWAY TONGUE

(57) Acute crossing of tongue forming railway apparatuses which can be incorporated to a continuous ribbon-rail, comprising a fixed element and a moving element, the fixed element (1) being comprised of a first molded part (1A) made of cast manganese steel and of a second part made in rails (1B) formed preferably by the junction of two rails to said first molded part (1A), which are appropriate to act as anchoring elements for accessories such as buffers, buffer-blocks, ribbed plates and expansion joint (3), the movable element (2) being comprised of a mold part (2A) made of cast manganese steel and of two rail parts (2B, 2B') joined to the prior, one of said rail parts (2B) being coupled to said rail-in made part (1B) of said fixed element (1) by means of screwed buffer-blocks (4A, 4B, 4C), the other of the two rail parts (2B') being coupled to the expansion joint (3), thereby providing means for sliding said movable element (2) inside said fixed element (1), as well as means for coupling the movable element (2) to the right or to the left.

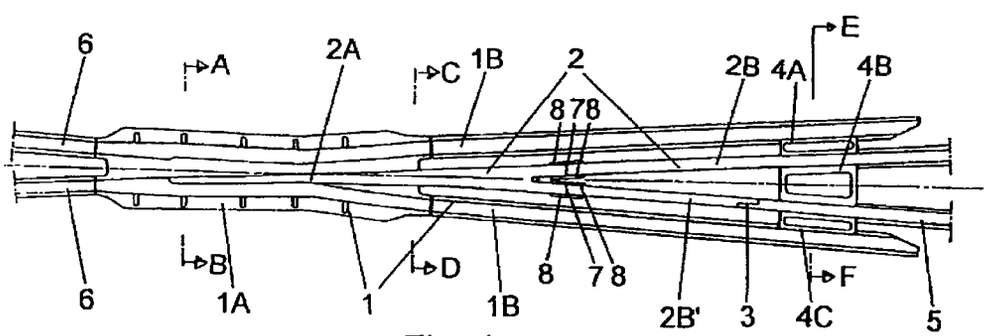

Fig. 1

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Description

The object of this invention refers, as its title indicates, to an acute crossing of tongue for railways, which can be incorporated to a continuous ribbon-rail, comprising a fixed element and a movable element, presenting important advantages over the methods currently used for this purpose.

Currently, two main embodiment types of acute crossings of tongue are known, as described below.

The first known type of acute crossing of tongue includes those crossings carried out entirely assembled, where the housing or casing, that is, the fixed element, is made of rails, preferably joined by brackets and bolts and nuts to a plate assembly, in turn joined to the sleeper, and the movable element is made of machined carbon steel rails or forged elements of the same material. Likewise, with the purpose of improving the wear properties in the rolling areas, different thermal hardening treatments have been proposed in said areas.

The second known type of acute crossing of tongue forming railways groups those crossings in which the fixed element, in its front part, is a cast mono-block, preferably of austenitic manganese steel, and the moving element is entirely made of machined rails.

Nevertheless, in the crossings of the first type, disadvantages are presented derived from the use of a fixed element with bolted joints, such as the maintenance requirements during service as well as the high noise level produced in case of maladjustment or loosening of said joints. Likewise, even when improving the wear behavior of the steel by means of a known thermal treatment, like profiling or others, said procedure is generally performed both on the fixed element and the movable element exclusively in the areas nearest to the surface, so that said characteristic of improved hardness is lost as the wear or the in-depth maintenance grinding advance. Finally, the difficulty of repairing the defects in the rolling area by means of welding should be mentioned, due to, for example, skidding of the train wheels, shocks, denting of the ballast on the rolling platform, etc. due to the wear or loss of the delicate thermal treatment after repair in the affected area. Anyway, said repair by welding, would have to be performed with great perfection and by very qualified personnel, due to its great importance, difficult circumstances when jobs are made in the open air.

For all these reasons, the crossings of the second described type represent an improved design with respect to the crossings of the first type, on eliminating the assembled fixed element and replacing the latter by a cast mono-block housing, preferably of austenitic manganese steel and making the movable element of a machined rail. In this case, the bolted unions are eliminated in the fixed element area subjected to passage of the wheel, with the consequent saving in maintenance costs. Likewise, with the preferable construction in molded austenitic manganese steel, the beneficial properties of said material with respect to shocks and wear are taken advantage of.

However, in crossings of said second type, the movable element is made by means of machined rails, with the aforementioned disadvantages involved in this type of execution.

In the railway field, the properties and advantages resulting from the use of austenitic manganese steel, due to the excellent combination of shock and wear resistance are well known. Said material undergoes a marked characteristic of superficial hardening by means of cold deformation on the passage of train wheels, in such a way that at its surface, an extremely hard layer is formed wich is suitable to resist wear and conserve in its core a high ductility permitting it to resist shocks and crack propagation.

When implemented, said material has a moderate natural surface hardness (approximately 200 HBN), so that in the first moments of its life it undergoes plastic deformations due to the passage of train wheels, provoking the typical lips and burrs on the edges of the rolling platforms. In fixed tongue crossings, said phenomenon causes a maintenance efford consisting of eliminating burrs by grinding when the crossing has achieved its superficial regime hardness (approximately 350 HBN-400 HBN).

Nevertheless, in crossings of tongue, a perfect coupling between the tongue or movable element and the housing of fixed element has to be assured to prevent the mismatching phenomena between both elements, which may damage the tongue when the train is passing or even cause its derailment, so that it is necessary to prevent burr phenomena in said coupling area.

With the purpose of efficiently rectifying the defects these currently existing crossings of tongue have, an acute crossing of tongue for railways has been developed, which is the object of this invention.

More specifically, this invention refers to an acute crossing of tongue suitable for being coupled to entrance and exit rails, consisting of a fixed element and another movable element, in which the former consists of a first part made of cast manganese steel and of a second part made in rails, preferably formed by joining two rails to said first part, which are appropriate to act as anchoring elements for accessories such as buffers, buffer-blocks, ribbed plates and expansion joint and whose movable element consists of an element made of cast manganese steel and by two rail parts joined to the former, one of said rails being joined to said part made of rails of said fixed element by means of bolted buffer-blocks and joining the other of said rails to the expansion joint, this latter part of the longitudinal rail sliding in the expansion joint on the side of the diverted line suitable to prevent the assembly formed by said moving element from forming a non-deformable triangle. Likewise, the acute crossing of tongue, object of this invention, has sliding means for the movable element inside the fixed element, as well as means for coupling the moving

element to the right or to the left.

Said rail parts, both the fixed element and the moving element, which are joined to the respective parts made of molded manganese steel, as well as the union of the fixed molded part with the entrance rails, is made by means of a welding procedure, preferably by sparking. Likewise, the union or unions of the molded part of the moving element with the rail parts of said moving element are reinforced, preferably by means of safety flanges.

Said cast parts, both of the moving and fixed elements can be made of thermally treated carbon or low alloy steel, and joined to the adjacent rails, that is, both parts of both elements made in rail, and the entrance rails, by means of conventional welding procedures. In the preferable construction, said parts made of cast manganese steel are preferably hardened by explosion in the areas subjected to wear and/or deformation by the train wheels, as well as in the areas of mutual coupling between said parts, up to a hardness of approximately 350 HBN.

From all the above, the advantages contributed by the acute crossing of tongue for railways, object of this invention, in its preferable construction can be easily deduced, in this way constituting as a perfecting of the two main existing types of crossing of tongue. Firstly, the advantages contributed by using high manganese content austenitic steel in the rolling areas, should be mentioned both of the fixed and the movable elements, since it benefits from the own advantages of said material, is a material that can easily be repaired by welding, is resistant to wear and shocks in the most critical crossing areas and one in which the hard layer of the material is regenerated with the passage of the wheels, as compared with materials hardened by thermal treatment, whose hard layer gradually disappears with wear. Likewise, the use of monolithic parts instead of assembled ones requires less maintenance and involves greater safety.

On the other hand, hardening by explosion of the manganese steel in the coupling areas of the moving and fixed elements, as well as in the rolling areas, permits a larger life of said elements, since it previously acquires an elevated hardness preventing initial wear and plastic deformations occurring in non-hardened manganese steel elements, a better conservation of the ideal geometrical shape of the elements subjected to contact with the wheel, tongue and housing, hence avoiding the formation of burrs, which may hinder the correct coupling between both, as well as noises and impacts in rolling and lower conservation costs, on preventing grinding jobs and burr elimination.

The described characteristics of the acute crossing of tongue for railways, object of this invention, makes it suitable for use in high speed lines (speeds higher than 300 km/h), as well as on lines of heavy loads per axle (loads higher than 25 t per axle), the detail design being adapted to the specific requirements of these types of exploitation.

To understand the object of this invention better, a preferential practical embodiment of the acute crossing of tongue for railways is described below, on the basis of the attached figures. Said figures show:

Figure 1, shows a plan view of the acute crossing of tongue for railways, object of this invention, giving passage to the circulation by direct rail, considering that said crossing is integrated in a simple diversion, with diversion to the right.

Figure 2, shows a plan view of the acute crossing of tongue for railways represented in the previous figure, giving passage to the circulation along the diverted rail.

Figures 3, 4 and 5 represent the sections according to the cuts AB, CD and EF of figure 1, respectively.

Figure 6 shows a plan view of the part made of cast manganese steel of the fixed element of the acute crossing of tongue for railways, object of this invention.

Figure 7 shows the section according to the cut OP of the part shown in the previous figure.

Figure 8 shows a plan view of the part made of cast manganese steel of the movable element of the acute crossing of tongue forming railways, object of this invention.

Figures 9 and 10 show the sections according to cuts QR and ST of the part shown in the previous figure, respectively.

As shown in figures 1 and 2, the acute crossing of tongue for railways, object of this invention, consists of a fixed element (1) and another movable element (2).

The fixed element (1) comprises a first molded part (1A) made of cast manganese steel and a second part made in rails (1B), formed by joining two rails to said first molded part (1A), which are appropriate to act as anchoring elements for accessories such as buffers, buffer-blocks, ribbed plates and expansion joint (3).

The moving element (2) consists of a first molded part (2A) of a triangular shape made of cast manganese steel and of two rail parts (2B, 2B'), joined to said molded part (2A) at its solepiece, across one or two of its extensions. One of said rail parts (2B) is joined to said part made in rails (1B) of said fixed element (1) by means of bolted buffer-blocks (4A, 4B, 4C). The other of said rail parts (2B') of the moving element (2) slides longitudinally on the expansion joint (3) formed by the rail part (2B') and the ribbon rail (5), with the purpose of preventing the triangle formed by said moving element (2) joined to the buffer-blocks (4A, 4B, 4C) comprising a

non-deformable triangle on making its lateral movement. Said parts of rail (2B, 2B') of the moving element (2) may be joined to the molded part (2A) by means of two independent joints, as shown in figures 1 and 2 or by means of a single double joint of both parts of the rail (2B, 2B') with said molded part (2A).

Figures 1 and 2 show the movable element (2) coupled on the fixed element (1), opening the way to circulation along the direct line and the diverted line, respectively. In both figures, the transfer of rolling between the fixed element (1) and the moving element (2) is performed in the respective parts made of molded manganese steel (1A, 2A), taking advantage of the excellent shock and wear characteristics of said material, since in this area shock and wear loads are produced, especially when worn wheel sets circulate as double flange.

In this way, the molded part (1A) of the fixed element (1) consists of an extended and hollow housing, within which the molded part (2A) of the moving element (2) slides (see figures 3 and 4), being joined on one side to the entrance rails (6) by means of a spark welding procedure and, on the other, to the part made in rails (1B) of the own fixed element (1), the latter being a support part of other items, such as buffers, buffer-blocks, etc.

Since the acute crossing of tongue, object of this invention, can be incorporated to continuous ribbon lines, the rail part (2B') and the ribbon rail (5) are directly welded to the adjacent rails by means of a procedure such as aluminothermy. Since the manganese steel making up the molded part (1A) of the fixed element (1) and the carbon steel of the adjacent rails (6) cannot be welded in a conventional way, it is necessary to use a special welding procedure, preferably by sparking, for the union of the former.

Said special welding procedure, preferably by sparking, will also be used for the union or unions (7) of the molded part (2A) with the rail parts (2B, 2B') of the moving element (2).

As said union or unions (7) are subjected to reversed bending when making the maneuver of the moving element (2), the former are reinforced by means of safety flanges (8) bolted to the core of the parts of the moving element (2), to provide greater safety to said union before said stresses.

Figures 3, 4 and 5 show different sections of the crossing of tongue for railways represented in figure 1. More specifically, figure 3 (section AB) corresponds to a coupling section of the molded manganese steel parts (1A, 2A) in the position of the movable element (2) shown in figure 1. Of course, the other position of the movable element (2) will be symmetrical to that shown in said figure 3. Figure 4 (section CD) corresponds to a section in the area where there is no direct coupling between the fixed element (1) and the movable element (2). Finally, figure 5 (section EF) corresponds to a crossing section representing the embedded area between the fixed element (1) and the movable element (2).

The molded parts (1A, 2A) made of cast manganese steel are preferably hardened by explosion in the areas subjected to wear and/or deformation by the train wheels, as well as in the areas of mutual coupling between said parts, up to a hardness of at least 350 HBN approximately. Figures 6 and 7 show by means of a grid and a dotted dashed line, respectively, different views of the areas to be hardened by explosion of the molded part (1A) of the fixed element (1) corresponding to the rolling platform and the coupling area between the former and the molded part (2A) of the movable element (2). Likewise, figures 8, 9 and 10 show by means of a grid and a dotted dashed line, respectively, different views of the areas to be hardened by explosion of the molded part (2A) of the movable element (2) coinciding with the rolling platform and with the coupling area between the former and the molded part (1A) of the fixed element (1).

The acute crossing of tongue is completed with apparatuses such as locks, checking rods, as well as other parts, which are not object of this patent.

The overall combination of the invention will adjust to the different gradients the rolling elements may take, whether 1:20, 1:30, 1:40 and even 1:∞.

Once the nature of this invention as well as a way to execute it have been sufficiently described, it should only be added that as a whole and in its parts, it is possible to introduce changes of shape, materials and arrangement, provided said alterations do not substantially vary the characteristics of the invention claimed below.

Claims

1. Acute crossing of tongue forming railway apparatuses which can be incorporated to a continuous ribbon rail, comprising a fixed element and a moving element, characterized in that the fixed element (1) consists of a first molded part (1A) made of cast manganese steel and by a second part made in rails (1B), formed preferably by the union of two rails to said first molded part (1A), which are appropriate to act as anchoring elements for accessories such as buffers, buffer-block, ribbed plates and expansion joint (3), in that the movable element (2) consists of a mold part (2A) made of cast manganese steel and of two rail parts (2B, 2B') joined to the former, one of said rail parts (2B) being coupled to said rail-in made parts (1B) of said fixed element (1) by means of screwed buffer blocks (4A, 4B, 4C), and joining the other of said rail parts (2B') to the expansion joint (3), and in that it provides means for sliding of said movable element (2) inside said fixed element (1), as well as means for coupling the movable element (2) to the right or to the left.

2. Acute crossing of tongue for railways, according to

the previous claim, characterized in that said rail part (2B') of the movable element (2) slides longitudinally in said expansion joint (3) on the side of the diverted line, suitable to prevent the triangle formed by said moving element (2) from constituting a non-deformable triangle.

3. Acute crossing of tongue for railways according to the previous claims, characterized in that the union of said rail parts (1B, 2B, 2B'), both of the fixed element (1) and the movable element (2) to the respective molded parts (1A, 2A) made of molded manganese steel, as well as the union of said mold part (1A) of the fixed element (1) to the entrance rails (6), is made by means of a welding procedure, preferably spark welding and in that the union or unions (7) of the mold part (2A) with the rail parts (2B, 2B') of the moving element (2) are reinforced by means of safety flanges (8).

4. Acute crossing of tongue for railways, according to the previous claims, characterized in that the mold parts (1A, 2A) are made of carbon or low alloy steel, thermally treating the rolling surfaces and joining them to the rail parts (1B, 2B, 2B') and adjacent rails (6) by means of conventional or special welding procedures.

5. Acute crossing of tongue for railways, according to claims 1, 2 and 3, characterized in that the molded parts (1A, 2A) made of cast manganese steel, are hardened by explosion up to an approximate hardness of 350 HBN in the areas submitted to wear, deformation by the train wheels, as well as areas of mutual coupling between them.

6. Acute crossing of tongue for railways, according to the previous claims, characterized in that the rolling elements, both fixed and moving, take gradients preferably of 1:20, 1:30, 1:40 or 1:∞.

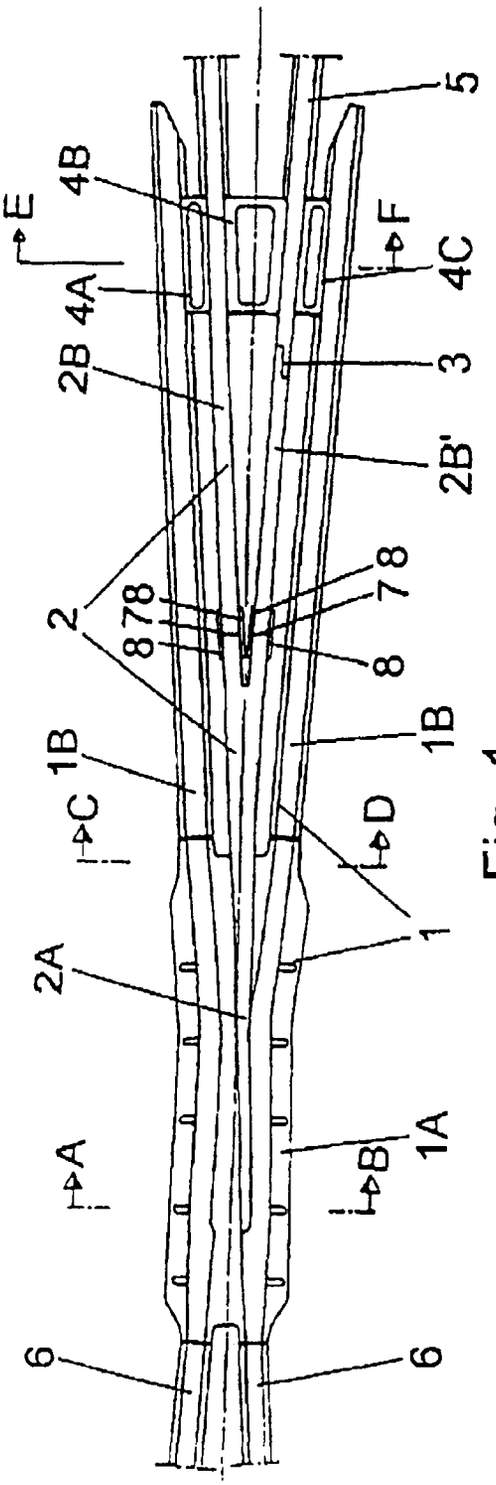

Fig. 1

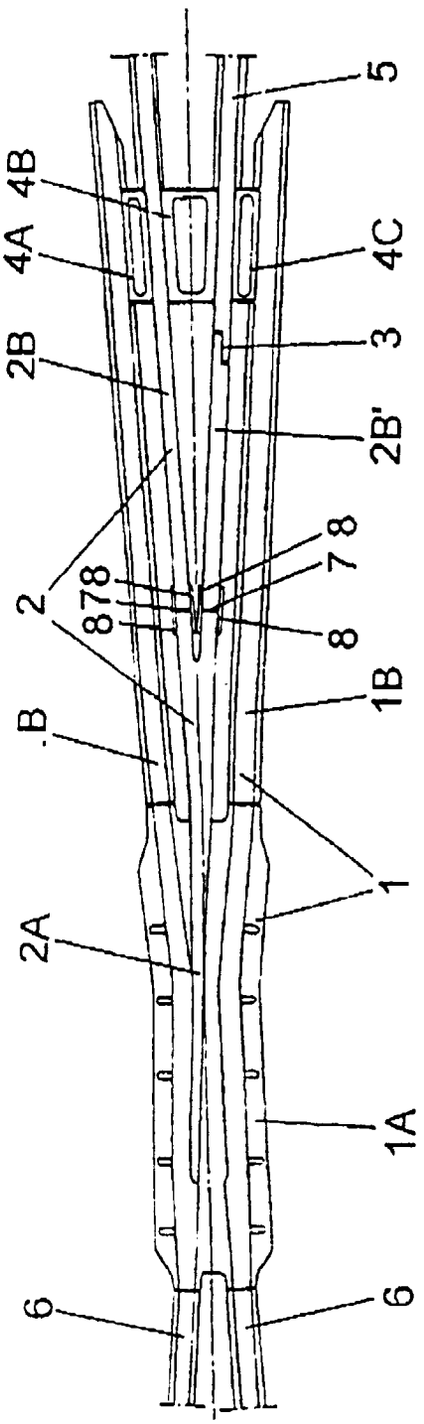

Fig. 2

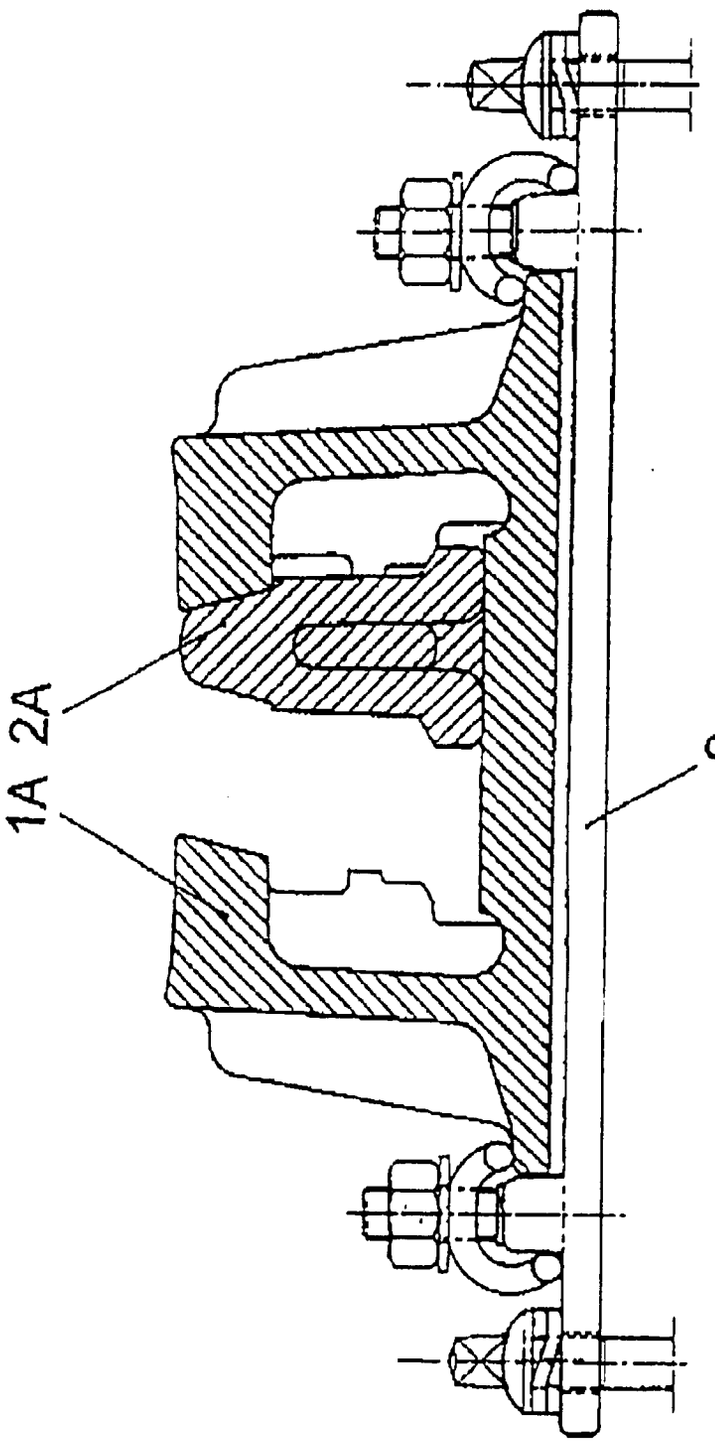

Fig. 3

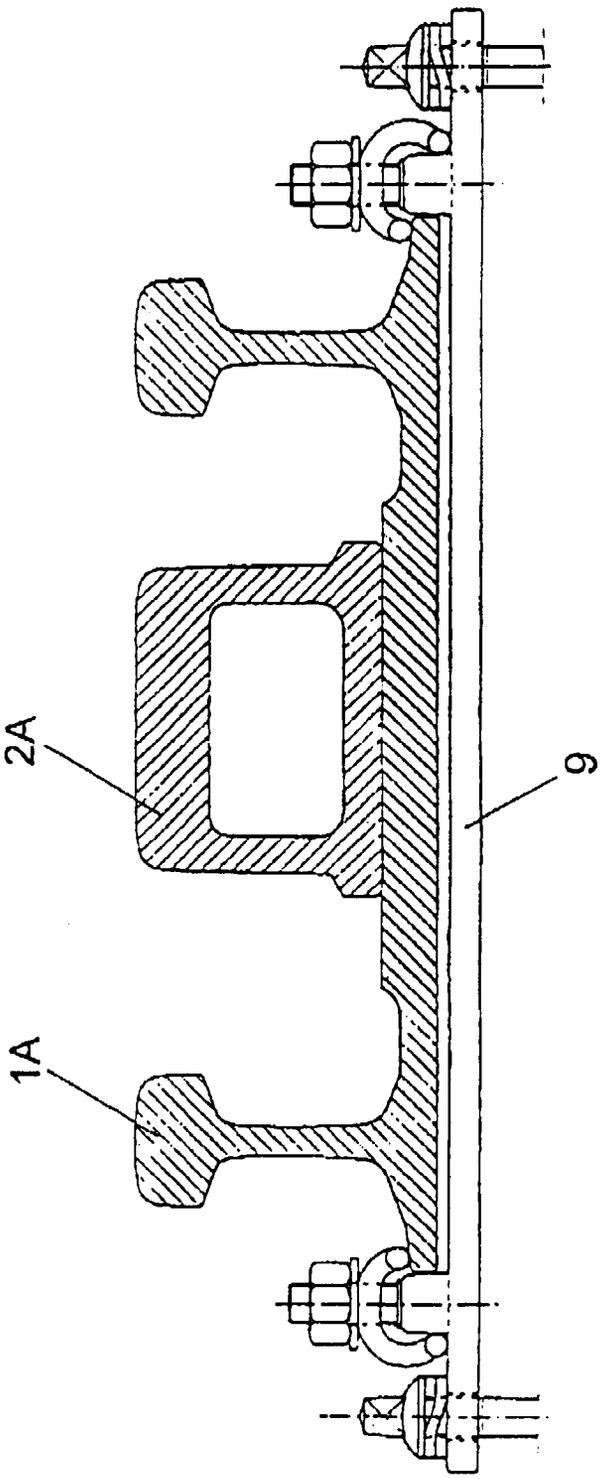

Fig. 4

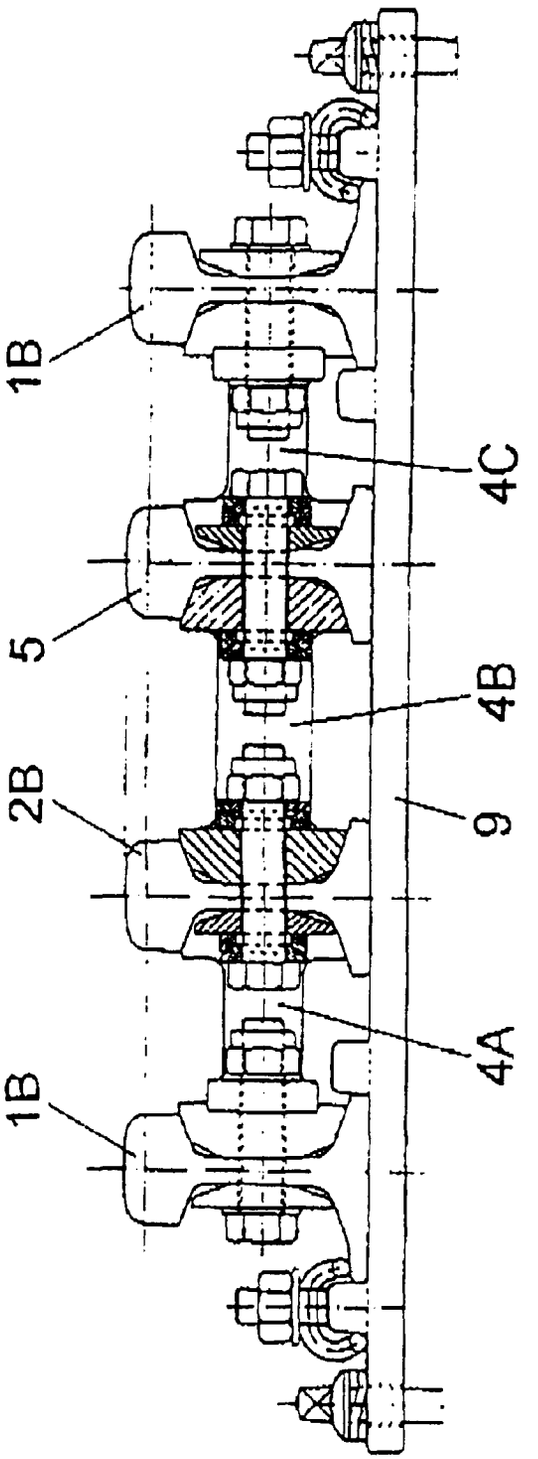

Fig. 5

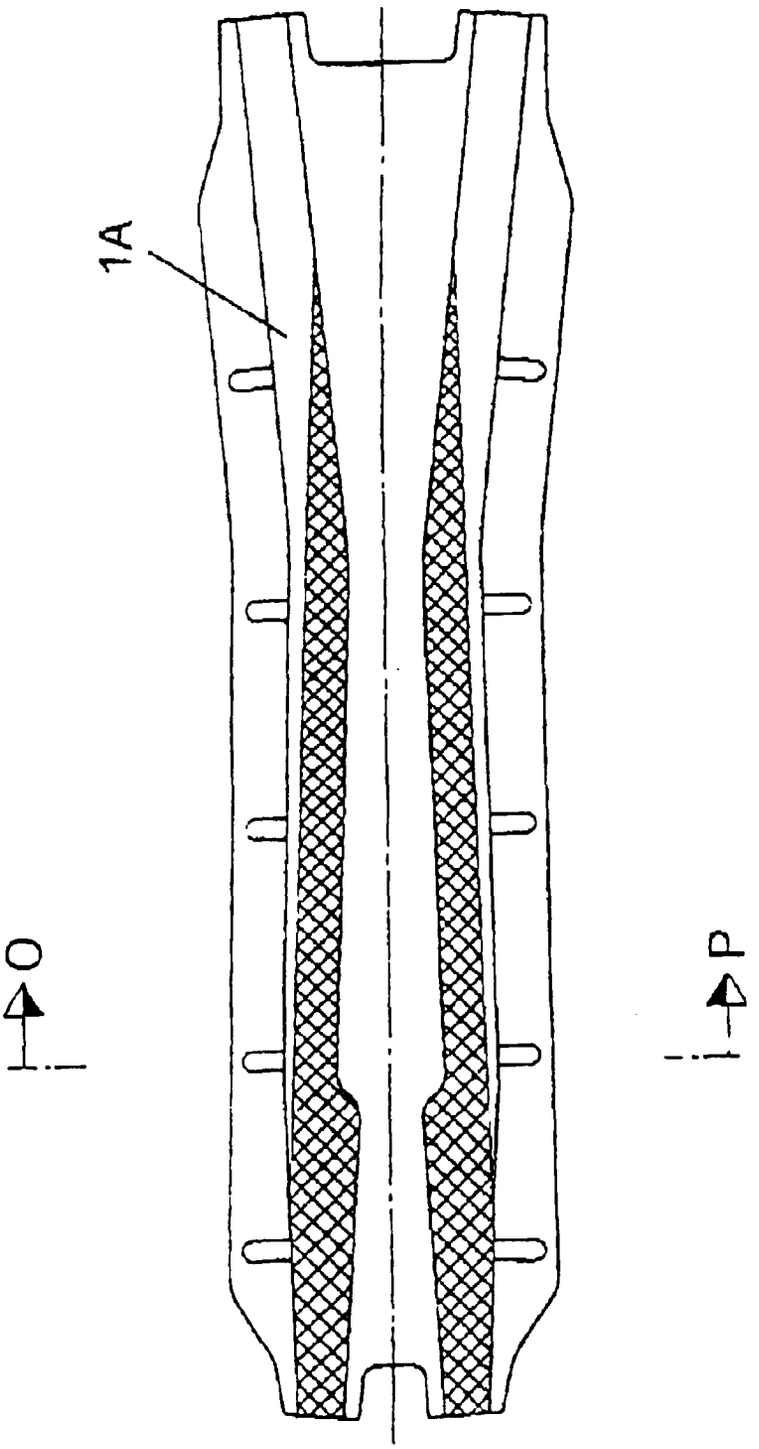

Fig. 6

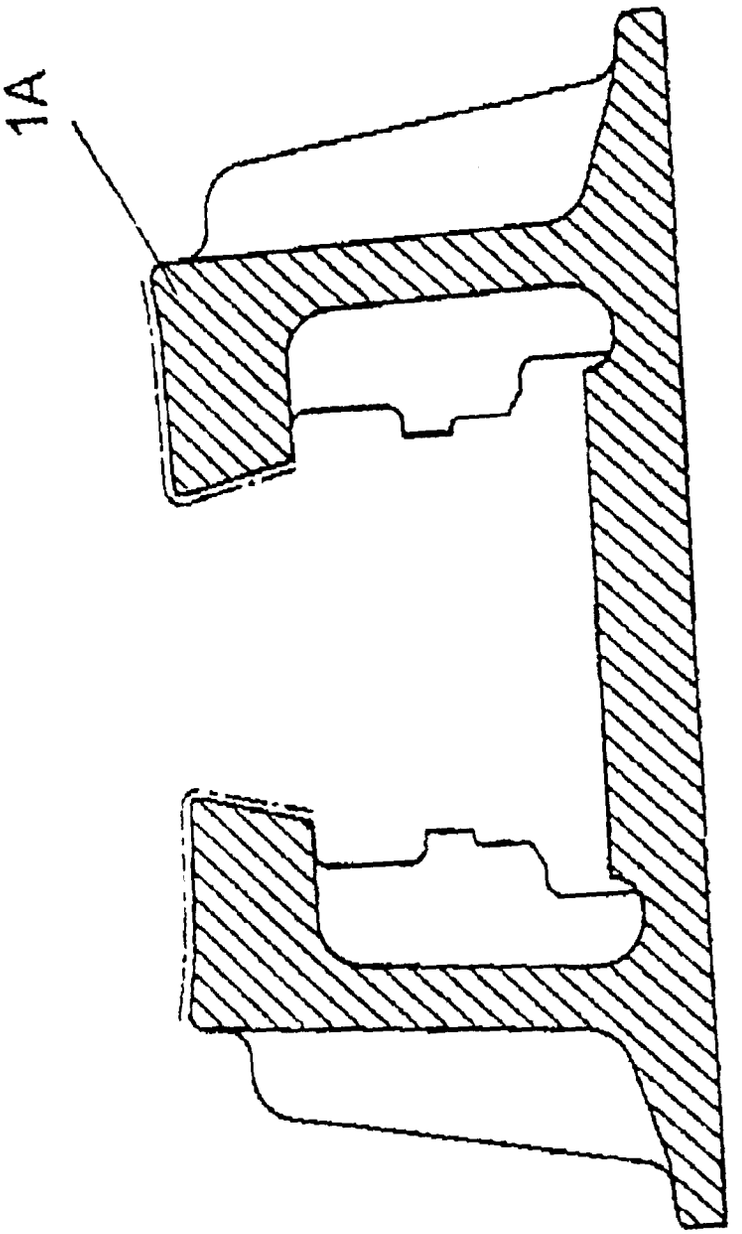

Fig. 7

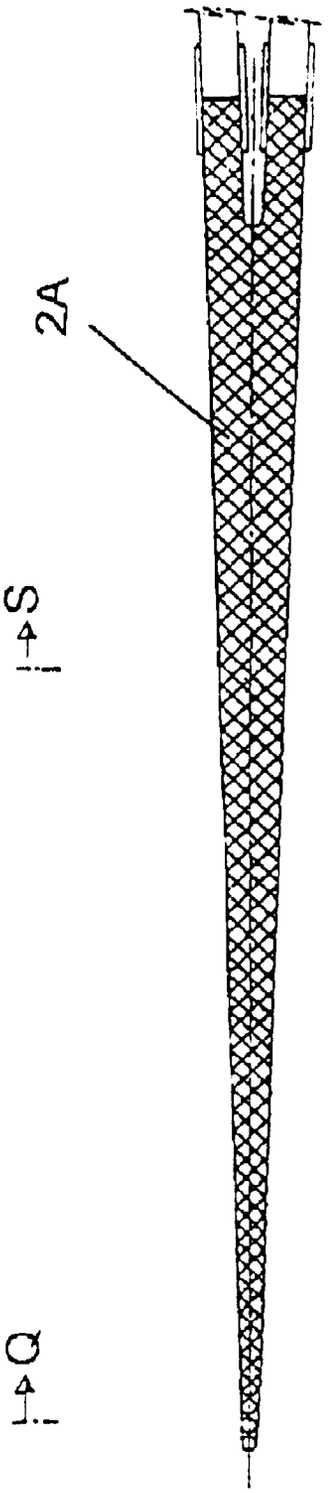

Fig. 8

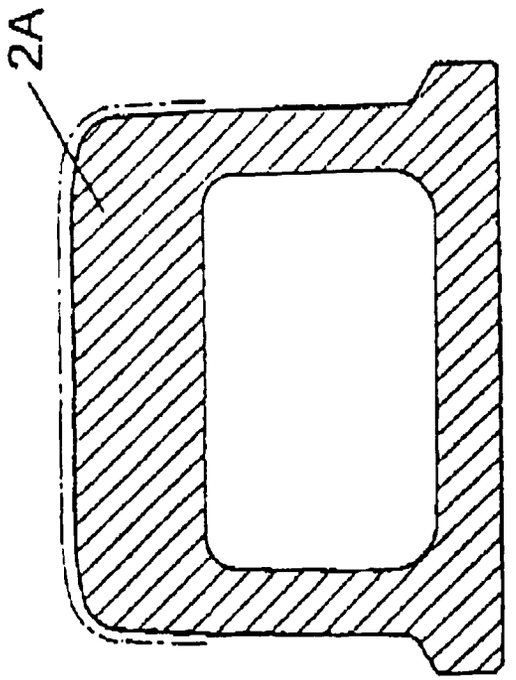

Fig. 10

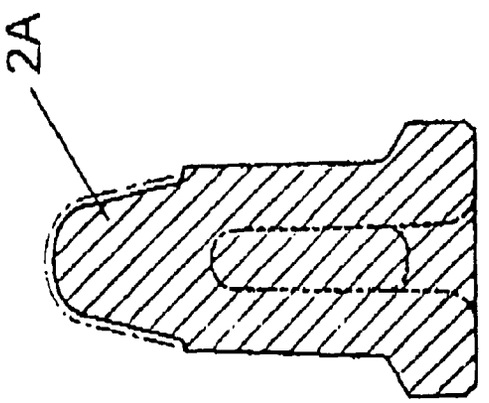

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 97/00104

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E01B7/14
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)
IPC 6 E01B

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 practicable, search terms used)
CIBEPAT,EPODOC,WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US-5366184-A (TESTART et al.) 22 November 1994 (22.11.94) see the whole document	1,3-6
A	US-3784134-A (CLAUS et al.) 08 January 1974 (08.01.74) see column 4, line 37- column 6, line 9; figures 1,2,4-6	1,4-6
A	FR-2640294-A (COGIFER) 15 June 1990 (15.06.90) see page 4, line 17- page 8, line 29; figures 1-7	1,3-6
A	US-3787680-A (PERROT) 22 January 1974 (22.01.74) see column 2, line 4- line 49; figures 1-8	1
A	EP-0143289-A (SCHRECK MIEVES GMBH) 05 June 1985 (05.06.85) see page 9, line 5- page 12, line 6; figures 1-13	1,3-6
A	FR-2700344-A (COGIFER) 13 July 1994 (13.07.94) see page 2, line 34- page 4, line 13; figure 1	5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 August 1997 (20.08.97)	29 August 1997 (20.08.97)
Name and mailing address of the ISA/ S.P.T.O. Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)