



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
06.12.2017 Bulletin 2017/49

(51) Int Cl.:
E01B 1/00 (2006.01) E01B 29/00 (2006.01)
E01B 37/00 (2006.01)

(21) Application number: **15879770.4**

(86) International application number:
PCT/ES2015/070069

(22) Date of filing: **30.01.2015**

(87) International publication number:
WO 2016/120504 (04.08.2016 Gazette 2016/31)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventors:
• **BOTELLO ROJAS, Faiver**
E-28108 Alcobendas (Madrid) (ES)
• **OSORIO MUÑOZ, Bladimir**
E-28108 Alcobendas (Madrid) (ES)
• **INAREJOS MESA, Javier**
E-28108 Alcobendas (Madrid) (ES)

(71) Applicant: **Acciona Infraestructuras, S.A.**
28108 Alcobendas (Madrid) (ES)

(74) Representative: **Elzaburu S.L.P.**
C/ Miguel Angel, 21
28010 Madrid (ES)

(54) **FORMWORK SEGMENT**

(57) The invention relates to a formwork segment (11) for the construction of a continuous carriageway for railway tracks, where the formwork segment (11) is rigidly connected to a carriageway segment (41), such that the formwork segment (11) remains permanently on the lower outer face of the carriageway segment (41) and is

non-demouldable, a hollow space (12) that can be filled with a poured material being provided, and the formwork segment (11) being made from a composite material such as a reinforced polymer fibre material, thermoplastic materials, or the like.

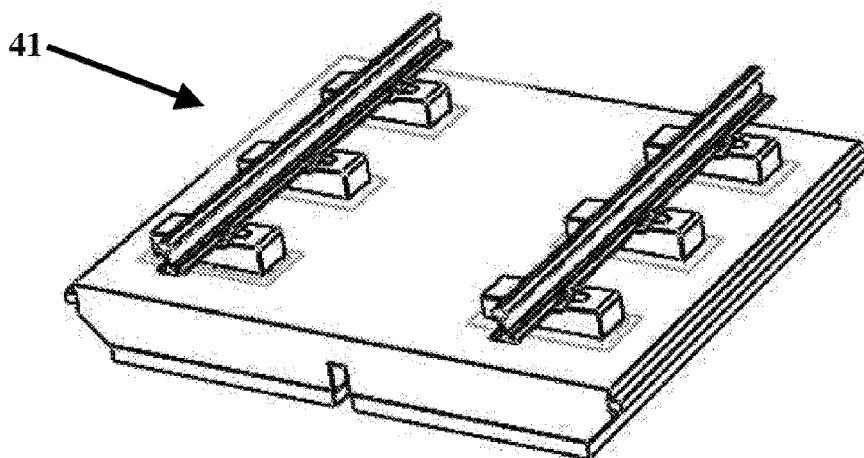


FIG. 4

Description

[0001] The present invention relates to a formwork segment for the construction of a continuous carriageway for railway tracks.

State of the art

[0002] Railway networks shaped like a compact concrete carriageway are known to be made with multiple carriageway segments arranged one after the other.

[0003] The carriageway segments are constructed on site using the previous assembly of a formwork system, which has to bear the pressure of fresh concrete, guarantee termination of the clean segment, and provide straight surfaces between adjacent carriageway segments.

[0004] The formwork systems are formed by boards of stable materials, which cover the entire width of individual carriageway segments, where both the assembly and removal of the formwork after the concreting to leave the carriageway free for railway tracks. Moreover, installing and removing the formwork is frequently associated with difficulties and partial destruction of the formwork material, in particular when the roots are already assembled over the carriageway segments.

Summary

[0005] The present invention tries to resolve one or more disadvantages shown above using a formwork carriageway segment for railway tracks as defined in the claims.

[0006] The formwork segment is a formwork element that is integrally connected to a carriageway segment of railway that remains permanently on the outside of the carriageway segment. As such, the formwork segment includes a carriageway segment, in which a material has been poured to form an integral and monolithic joint, i.e., a single element where the formwork segment is non-demouldable from the carriageway segment.

[0007] The formwork segment is configured to form a hollow space to be filled with a poured bearing material bound hydraulically, concrete, asphalt, composite or similar material that railway tracks bear. As such, the formwork segment presents an essentially rectangular transversal section.

[0008] The formwork segment comprises at least one projection as ribbing or generatrix at the outer face of the hollow space of the formwork segment to facilitate transmission of tensions between the poured material and the formwork segment, preventing relative slipping between both of them.

[0009] The projection is of rectilinear polygon type in the longitudinal and/or transversal direction of the formwork segment and has a negative dovetail type outgoing core that is a non-demouldable formwork segment.

[0010] The formwork segment is configured to receive

an anti-slip material of type sand coated with resin, on which the fresh poured material is emptied, within the hollow space of the formwork segment.

[0011] The formwork segment is configured to provide multiple concave or convex crimps distributed at this outer face to prevent relative slipping between the poured material and the formwork segment, increasing the friction between the poured material and the formwork segment. In summary, the formwork segment enters into the slab of the poured material or vice versa to increase the adherence between both.

[0012] The formwork segment is adapted to bear the pressure of the poured material within the hollow space of the formwork segment and subsequently, of the poured material hardened by curing or setting.

[0013] In addition, the formwork segment is configured to be transported empty or filled with poured material up to its working position above a foundation or continuous base plate of a track system.

[0014] The formwork segment is configured to provide multiple bumps at its lower outer face as figures jutting out or projected beyond the surface of the lower outer face distributed at this lower outer face to prevent relative slipping between the formwork segment and the foundation, increasing the friction between the formwork segment and the foundation. In summary, the formwork segment enters into the foundation to obtain an anchoring effect by increasing the adherence between the formwork segment and the foundation.

[0015] According to one variant, the foundation includes at least one insertion beyond the surface and the foundation at a predetermined height to enter into a hollow deformation including the projection so as to receive the insert of the foundation, providing a similar anchoring effect between the formwork segment and the foundation.

[0016] The formwork segment is configured to receive an elastic material within the hollow space of the formwork segment in the shape of a blanket of elastomeric type of material to control vibrations and noise generated by the movement of railway vehicles on track systems.

[0017] The formwork segment is configured to be installed in its working position, directly supported above the foundation or directly supported above an elastic material of an elastomeric type of material, which is directly supported above the foundation with the objective of increasing the elasticity between the foundation and the formwork segment and decreasing the dynamic loads when railway vehicles pass.

[0018] The formwork segment is configured like a pre-fabricated part, which achieves a bench of continuous integral vehicular action by juxtaposing a big number of formwork segments, making some formwork segments bump into other formwork segments; and joining the segments among themselves.

[0019] The use of pre-fabricated parts facilitates repairs and replacement of a formwork segment damaged by wear and tear or any other condition. As such, the

formwork segment minimizes costs arising from railway maintenance and conservation operations.

[0020] The formwork segment includes a number of hollows or spaces, which can receive multiple points of track support for assembly and fastening of two tracks running parallel to each other. The points of support are projected beyond the surface of the slab of the poured material at a predetermined height.

[0021] The formwork segment is also configured for embedding of multiple points of track support for assembly and fastening of two tracks running parallel to each other within the poured material. As such, the points of support of the tracks must be routed individually or like sleepers within the formwork segment before emptying the poured material within the hollow space of the formwork segment.

[0022] The formwork segment is configured to provide two rows of continuous parallel hollows to the longitudinal axis of the formwork segment for embedding and fastening of two tracks running parallel to each other within the slab of the poured material. The tracks previously to be embedded in the formwork segment are cased with elastic material that envelops the tracks and gives elastic properties to buffer the vibrations and control the noise generated by the movement of railway vehicles. The elastic material is installed within the continuous hollow of the slab of the poured material.

[0023] The formwork segment is made from a material composed of material of reinforced polymer fibre type, thermoplastic, or similar materials.

Brief description of the figures

[0024] A more detailed explanation of the system in accordance with embodiments of the invention is given in the below description based on the enclosed figures, in which:

Figure 1 shows a perspective view of a formwork segment without filling poured material; the formwork segment has an essentially rectangular transversal section,

Figure 2 shows a perspective view of the formwork segment with two rows of empty hollows to receive points of track support for assembly and fastening of two tracks running parallel to each other; the lower outer face of the formwork segment is assembled in physical contact with a blanket of elastic material,

Figure 3 shows a perspective view of a formwork segment with two rows of empty hollows receiving points of track support, to which two railway tracks are assembled and fastened, with the formwork segment assembled in physical contact with a blanket of elastic material,

Figure 4 shows a perspective view of the formwork

segment with two rows of empty hollows receiving points of track support, to which two railway tracks are assembled and fastened, with the formwork segment assembled in physical contact with the blanket of elastic material, and where the points of support are projected beyond the surface of the slab of the poured material at a predetermined height, and

Figure 5 shows a perspective view of a continuous carriageway of railway tracks including multiple formwork segments juxtaposed, making some formwork segments bump into other formwork segments.

DESCRIPTION

[0025] Now, with respect to figures 1, 4 and 5, where a formwork segment 11 is shown, which is a formwork element that will remain integrally connected to a carriageway segment 41 of railway, i.e., the formwork segment 11 that remains permanently on the outside of the carriageway segment 41. As such, carriageway segment 41 comprises a formwork segment 11, in which a material has been poured to form an integral and monolithic joint, where the formwork segment 11 is non-demouldable from the carriageway segment 41. Formwork segment 11 has an essentially rectangular transversal section.

[0026] Formwork segment 11 forms a hollow space 12 to be filled with a poured bearing material of binding material type, capable of entering into the composition of a poured slab of the poured material bound hydraulically, concrete, asphalt, composite or similar material that railway tracks 31 bear.

[0027] Formwork segment 11 comprises at least one projection 13 as ribbing or generatrix at the outer face of the hollow space 12 of formwork segment 11 to facilitate transmission of tensions between the poured material and formwork segment 11, preventing relative slipping between both of them. In addition, projection 13 is a hollow conduit that can receive technical equipment, fluid distribution pipes, cables and other type of material related to maintenance, help, control and management of the movement of railway vehicles over railways of track systems, or other type of civil infrastructure, inside.

[0028] Projection 13 is of rectilinear polygon type in the longitudinal direction of formwork segment 11 and has a negative dovetail type such that formwork segment 11 is non-demouldable.

[0029] Formwork segment 11 is configured to receive an anti-slip material of type sand coated with resin, on which the fresh poured material is emptied, within the hollow space 12 of the formwork segment.

[0030] Formwork segment 11 provides a plurality of dents or bumps at its outer face 14 of the hollow space 12 of the formwork segment 11 as figures jutting out projected beyond lower outer face 12 of the hollow space 11, being distributed at outer face 14 to prevent relative slipping between the slab of the poured material and formwork segment 11, increasing the friction between

the poured material and formwork segment 11. In summary, formwork segment 11 enters into the slab of the poured material or vice versa to increase the adherence between both.

[0031] Formwork segment 11 bears the pressure of the poured material within hollow space 12 of formwork segment 11 and subsequently, of the poured material hardened by curing or setting.

[0032] In addition, formwork segment 11 is transportable empty or filled with the slab of the poured material up to its working position above a foundation or continuous base plate of a track system.

[0033] Formwork segment 11 provides a plurality of projections at the lower outer face 15 as figures jutting out projected beyond the surface of the lower outer face 15, which are distributed at the lower outer face 15, preventing relative slipping between the slab of the poured material and formwork segment 11 by increasing the friction between formwork segment 11 and the foundation.

[0034] In summary, formwork segment 11 enters into the foundation to obtain an anchoring effect by increasing the adherence between formwork segment 11 and the foundation.

[0035] As per one variant, the foundation comprises at least one insertion projected beyond the surface of the foundation at a predetermined height to enter into a hollow deformation 16 of projection 13, which receives the insert of the foundation, providing a similar anchoring effect between formwork segment 11 and the foundation.

[0036] Formwork segment 11 receives an elastic material within the hollow space 12 of formwork segment 11 in the shape of a blanket of elastomeric type of material to control vibrations and noise generated by the movement of railway vehicles over railways of a track system.

[0037] Formwork segment 11 is installed in its working position, directly supported above the foundation or directly supported above an elastic material of an elastomeric type of material, which is in turn directly supported above the foundation with the objective of increasing the elasticity between the foundation and the formwork segment and decreasing the dynamic loads when railway vehicles pass.

[0038] Formwork segment 11 is produced like a prefabricated part, which juxtaposing a big number of aligned formwork segments 11, making some formwork segments 11 bump into other formwork segments 11; joining the segments 11 among themselves achieves a bench of continuous integral rolling.

[0039] With respect now to the figures 2 to 5 that show formwork segment 11 including a plurality of empty hollows 21, which can receive a plurality of points of track support 31 for assembly and fastening of two tracks 32 running parallel to each other. Points of support 31 are projected beyond the surface of the slab of the poured material at a predetermined height. Point of support 31, once inserted within the hollow 21 is supported by a cover part 22 of elastic material to reduce noise and vibrations generated by the movement of vehicles on railways of

the track system.

[0040] Points of track support 31 are inserted within the slab of the poured material. As such, the points of support 31 of the tracks must be routed individually or like sleepers within formwork segment 11 before emptying the freshly poured material within the hollow space 12 of formwork segment 11.

10 Claims

1. Formwork segment of construction of a continuous carriageway for railway tracks, where the formwork segment (11) is integrally connected to a carriageway segment (41), remaining permanently on the lower outer face of the carriageway segment (41), the formwork segment (11) being non-demouldable, and providing a hollow space (12) that can be filled with a poured material.
2. Segment according to claim 1, **characterized in that** the formwork segment (11) is made from a material composed of material of reinforced polymer fibre type, thermoplastic, or similar materials.
3. Segment according to claim 1, **characterized in that** the poured material is of bearing material type bound hydraulically, concrete, asphalt, composite or similar material.
4. Segment according to claim 3, **characterized in that** the poured material is emptied over an anti-slip material deposited previously on the outer face (14) of the hollow space (12) of the formwork segment (11).
5. Segment according to claim 3, **characterized in that** the poured material is emptied over an elastic material deposited previously on the outer face (14) of the hollow space (12) of the formwork segment (11).
6. Segment according to claim 1, **characterized in that** the formwork segment (11) comprises at least one projection (12) jutting out beyond the outer face (14) of the hollow space (12) of formwork segment (11) to facilitate transmission of tensions between the poured material and formwork segment (11).
7. Segment according to claim 6, **characterized in that** the projection (13) is of rectilinear polygon type in the longitudinal and/or transversal direction of the formwork segment (11) and presents a negative outgoing core.
8. Segment according to claim 1, **characterized in that** the formwork segment (11) is configured to provide, on the outer face (14) of the hollow space (12) of formwork segment (11), a plurality of dents distributed at the outer face (14) entering into the slab of

the poured material or vice versa to increase the adherence between both.

9. Segment according to claim 1, **characterized in that** the formwork segment (11) is configured to provide a plurality of projections at its lower outer face (15) as figures jutting out, projected beyond the surface of the lower outer face (15), distributed at the lower outer face (15), to enter into a foundation providing a similar anchoring effect between the formwork segment (11) and the foundation.

5
10

10. Segment according to claim 9, **characterized in that** the formwork segment (13) comprises a hollow deformation (16) configured to receive an insert that is projected beyond the surface of the foundation at a predetermined height to enter into the hollow deformation (16).

15

11. Segment according to claim 1, **characterized in that** the formwork segment (11) comprises a number of empty hollows (21), which can receive a plurality of points of track support (31) for assembly and fastening of two railway tracks (32) running parallel to each other, where the points of support (31) are projected beyond the surface of the slab of the poured material at a predetermined height.

20
25

12. Segment according to claim 1, **characterized in that** the formwork segment (11) is configured to include a plurality of points of track support (31) for assembly and fastening of two railway tracks (32) running parallel to each other within the slab of the poured material.

30
35

13. Continuous carriageway of railway tracks, **characterized in that** the carriageway comprises a plurality of formwork segments juxtaposed, according to claims 1 to 12, making some formwork segments bump into other formwork segments.

40

45

50

55

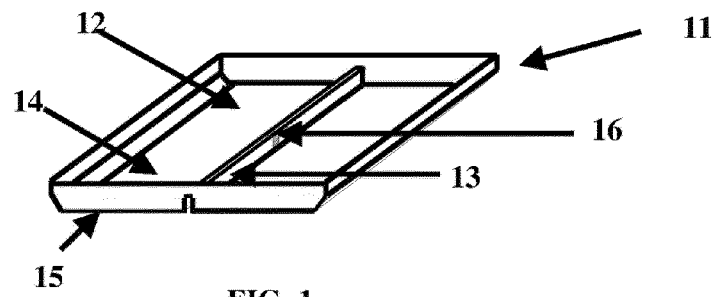


FIG. 1

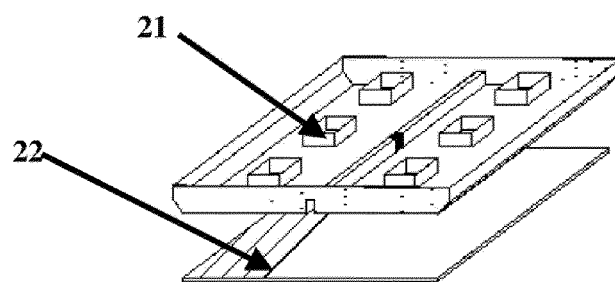


FIG. 2

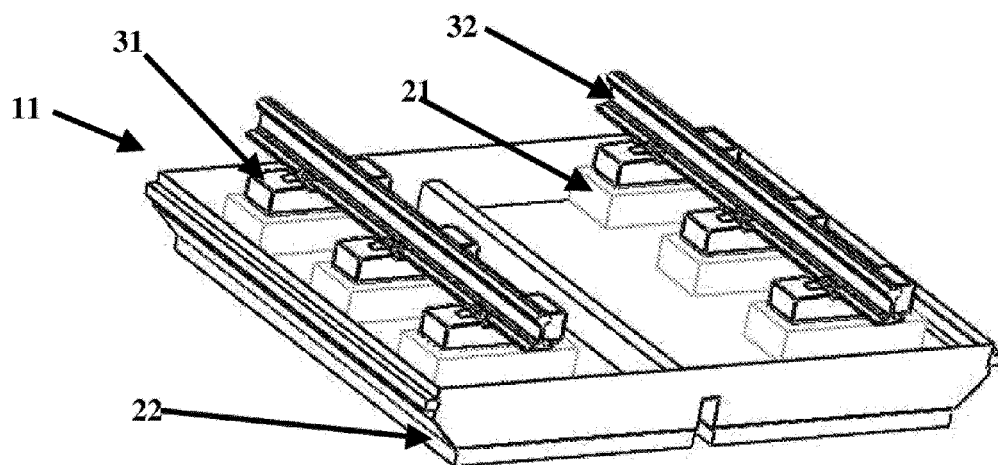


FIG. 3

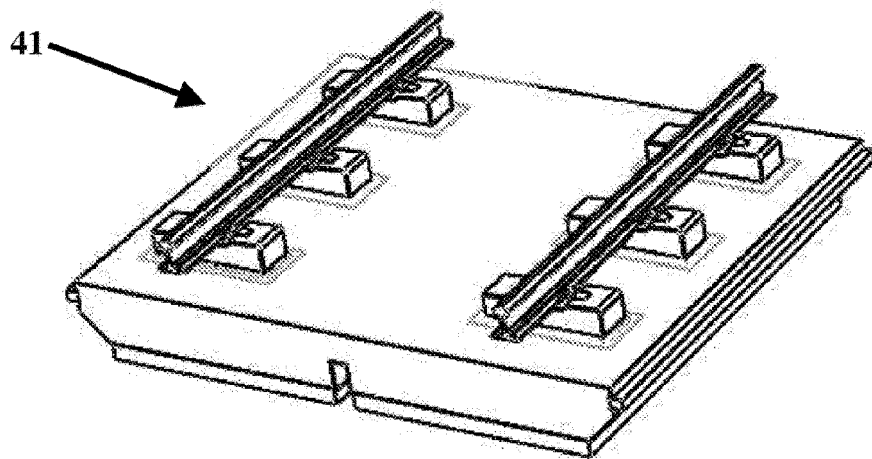


FIG. 4

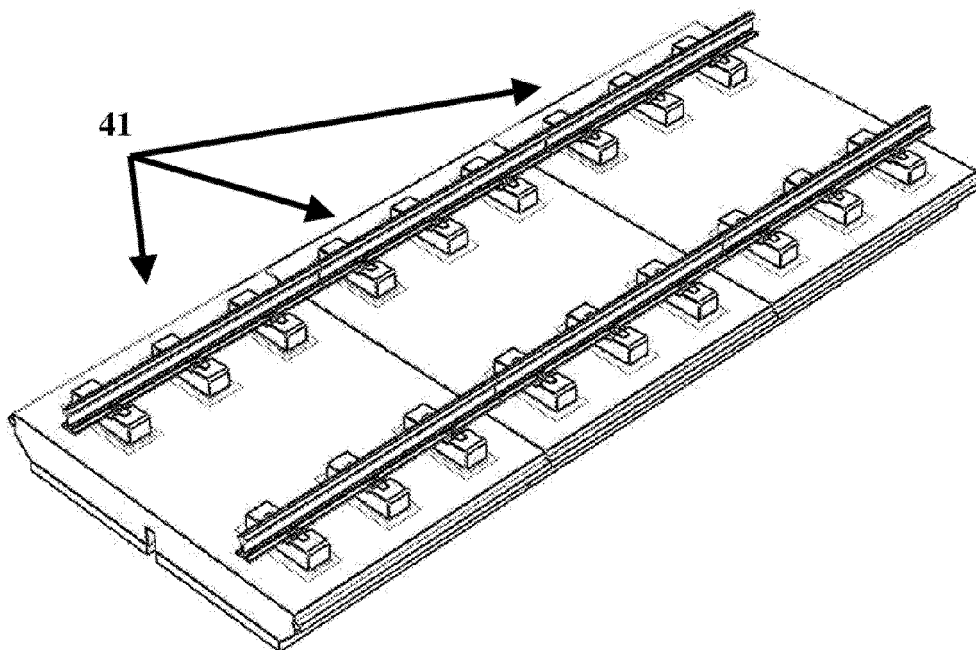


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2015/070069

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

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)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001020202 A (TEITO RAPID TRANSIT AUTHORITY ET AL.) 23/01/2001, figures & Abstract of the DataBase WPI. Retrieved from EPOQUE; AN 2001-198174 .	1-13
A	ES 2371568 A1 (UNIV DA CORUNA) 05/01/2012, pages 2 - 4; figures.	1-13
A	WO 2012111031 A1 (IPA INTERNAT RAIL SYSTEM TECHNOLOGY S R L ET AL.) 23/08/2012, figures & Abstract from DataBase WPI. Retrieved of EPOQUE; AN 2012-L17537.	1-13
A	US 2010294847 A1 (CARELS PATRICK CARELS PATRICK ET AL.) 25/11/2010, pages 1 - 4; figures.	1-13

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.	
"E" earlier document but published on or after the international filing date	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"O" document referring to an oral disclosure use, exhibition, or other means.	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents , such combination being obvious to a person skilled in the art
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search
16/10/2015Date of mailing of the international search report
(19/10/2015)

Name and mailing address of the ISA/

OFICINA ESPAÑOLA DE PATENTES Y MARCAS
Paseo de la Castellana, 75 - 28071 Madrid (España)
Facsimile No.: 91 349 53 04

Authorized officer

M. Castañón Chicharro

Telephone No. 91 3493261

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2015/070069

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
JP2001020202 A	23.01.2001	JP3552030B B2	11.08.2004
ES2371568 A1	05.01.2012	NONE	
WO2012111031 A1	23.08.2012	RU2012146594 A EP2675953 A1	10.05.2014 25.12.2013
US2010294847 A1	25.11.2010	BRPI0811571 A2 US8393552 B2 CA2687027 A1 BE1017597 A6 EP2155964 A1 EP2155964 B1 WO2008138913 A1 EP2014831 A1	09.12.2014 12.03.2013 20.11.2008 13.01.2009 24.02.2010 18.06.2014 20.11.2008 14.01.2009

Form PCT/ISA/210 (patent family annex) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2015/070069

5

CLASSIFICATION OF SUBJECT MATTER

E01B1/00 (2006.01)

E01B29/00 (2006.01)

E01B37/00 (2006.01)

10

15

20

25

30

35

40

45

50

55

Form PCT/ISA/210 (extra sheet) (January 2015)