(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 851 579 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.07.2021 Bulletin 2021/29

(51) Int Cl.:
E01B 2/00 *(2006.01)* ***E01D 19/12*** *(2006.01)*

(21) Application number: **21151925.1**

(22) Date of filing: **15.01.2021**

(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
KH MA MD TN

(30) Priority: **16.01.2020 IT 202000000772**

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(54) SUPPORTING STRUCTURE FOR THE PROVISIONAL SUPPORT OF RAILWAY TRACKS

(57) A supporting structure (10) for the provisional support of railway tracks is described. The structure comprises two metal assemblies (15) for supporting the respective rails (5), each metal assembly (15) comprising a plurality of metal cross saddles (30) fastened to horizontal metal beams (20, 20') arranged parallel to the rails (5) of the track. The metal assemblies (15) for supporting the rails (5) are joined together through metal plates (40) bolted to metal fins (50), the latter being fastened to the metal beams (20, 20'). A plate of electrically insulating material is interposed between each of the metal plates (40) and the corresponding metal fins (50), and a bushing of electrically insulating material is fitted on each of the metal bolts.

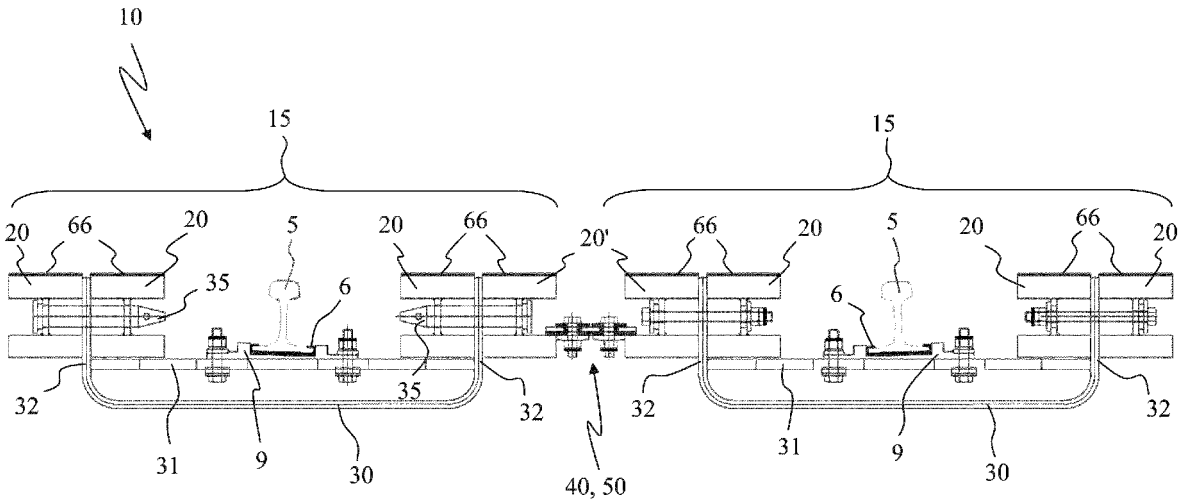

Fig. 4

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Description

Field of the Invention

[0001] The present invention relates to a structure for the provisional support of railway tracks and, in particular, to a supporting structure used to allow the implementation of manufactured articles generally under the permanent way, such as, for example, underpasses, subways, manholes and the like, as well as excavations generally under track in operation; moreover, to allow the securing and/or reconstruction of works of art, for example bridges, masonry viaducts, underpasses, subways and the like, which show signs of instability, such as to require major consolidation and/or renovation interventions, which cannot be carried out quickly. As these interventions are carried out during operation, it is necessary to guarantee the continuity of railway transport while maintaining a high level of safety for the trains and the operators carrying out the interventions.

Prior Art

[0002] The works for the provisional support of the tracks, also known as provisional bridges, are essentially constituted by horizontal supporting structures and by the respective bearing systems.

[0003] The Patent Application no. MI92A002239, for which Patent no. IT1255694 was granted, describes a structure for the provisional support of railway tracks, which comprises a plurality of horizontal beams arranged parallel to the rails of a track and two assemblies for supporting the respective rails. Each supporting assembly comprises a plurality of cross saddles fastened to the beams in positions comprised between successive crossbars of the track along the entire length of the same beams, as well as means for the mutual fastening of the assemblies for supporting each rail. All the elements that compose this known supporting structure are made of metal, for example steel or the like, to guarantee the necessary robustness of the same structure.

[0004] The stresses and vibrations transmitted to the rails during the transit of the trains are discharged on the coupling nuts and bolts of the various elements that compose the structure and can lead to the loosening of the bolts that fasten the elements supporting the saddles. A solution adopted so far to limit this drawback, in addition to the one of applying lock nuts, has been to insert a pad of vibration-damping material between each rail and the respective supporting elements which are fastened to the cross saddles.

[0005] The rails must be electrically insulated from each other, not only to guarantee the correct operation of the safety systems acting on the trains, but also to guarantee the safety of the personnel operating at the provisional structure. Therefore, the material with which the pad of vibration-damping material is made of is selected from those also having electric insulation characteristics.

[0006] However, due to vibrations and therefore the resulting loosening of nuts and bolts, the pads of vibration-damping and electrically insulating material can be removed from their position, thus causing an electrical contact between the rail and the respective underlying support. In the rather frequent case that this occurs on both rails, even in individual positions, the electric insulation between the same is lost.

Summary of the Invention

[0007] This being stated, an object of the present invention is to propose a supporting structure for the provisional support of railway tracks, which guarantees electric insulation between the rails.

[0008] Another object of the present invention is to propose a supporting structure of the above-mentioned type, which guarantees a high degree of safety both for trains in transit and for operators present near the supporting structure.

[0009] A further object of the present invention is to propose a supporting structure of the above-mentioned type, which guarantees high characteristics of robustness and reliability.

[0010] These and other objects are achieved by the present invention thanks to a supporting structure for the provisional support of railway tracks according to claim 1. Further peculiar characteristics of the supporting structure of present invention are set forth in the respective dependent claims.

[0011] A supporting structure for the provisional support of railway tracks generally comprises a plurality of horizontal metal beams arranged parallel to the rails of the track, wherein the horizontal metal beams are supported by appropriate bearing devices. The supporting structure provides two metal assemblies for supporting the respective rails, each metal assembly comprising a plurality of metal cross saddles fastened to the metal beams in positions comprised between the positions of successive crossbars of the track along the entire length of the same beams. The supporting structure also provides means for the mutual fastening of the metal supporting assemblies for the rails, which comprise a plurality of metal plates, metal bolts, metal nuts, bushings of electrically insulating material and a plurality of metal fins, the latter being fastened to the metal beams, arranged in spaced apart and mutually corresponding positions along one side of each metal assembly, the metal plates and the metal fins being equipped with through holes in corresponding positions for the fastening by metal bolts coupled to metal nuts.

[0012] The supporting structure according to the present invention comprises at least one plate of electrically insulating material interposed between each of the metal plates and the corresponding metal fins fastened to the metal beams, and at least one bushing of electrically insulating material fitted on each of the metal bolts.

[0013] This way, the electric insulation between the rails is guaranteed, independently of any undesired displacements of other insulating elements, such as for example the pads of insulating material, which are interposed between each supporting element and each rail.

[0014] The supporting structure may in any case comprise at least one pad of electrically insulating and vibration-damping material, which is interposed between each supporting element and each rail.

[0015] The electrically insulating and vibration-damping pad preferably comprises a front flap and a rear flap which protrude downwards to abut against the respective front and rear surfaces of a supporting element.

[0016] In order to guarantee a further electric insulation between the rails, a foil of electrically insulating material is applied to the top surface of the metal beams, which constitute the two assemblies for supporting the supporting structure. Alternatively, the electric insulation between the two metal assemblies can be implemented by applying to the top surface of the metal beams, a layer of insulating protective paint resistant to high temperatures, which forms a hard and flexible film having high resistance to heat and to chemical agents without corrosive effects. The film can then be coated with an acrylic enamel.

[0017] The supporting structure further comprises anti-loosening devices combined with each of the metal bolts to prevent the unscrewing of the respective metal nuts. An example of similar devices can be the anti-loosening device distributed under the trademark "Lockone", which is able to guarantee a greater resistance to vibrations with respect to the conventional nut/lock nut system.

[0018] With respect to the prior art, the supporting structure according to the present invention comprises metal beams with a "double T" section and free of reinforcements applied to their base plates. In practice, each "double T" beam is formed by two parallel base plates, which are sealed to a central core perpendicular to the base plates. A supporting structure is thus obtained, which is more robust than that of the prior art and in any case simpler to make.

[0019] Each of the metal saddles further comprises two wings perpendicularly arranged to a flat portion at its lateral ends, and wherein the wings are equipped with through holes for the fastening to the metal beams.

[0020] In particular, each of the metal supporting assemblies comprises two pairs of metal beams equipped with through holes. The beams of each pair are arranged side by side with the opposite faces of the wings of the saddles and in close contact therewith. The saddles are fastened to the metal beams by calibrated metal plugs inserted in the through holes of the beams and in the through holes present on the wings of the saddles. One or more strips are fastened through nuts and bolts to the metal beams for holding in position the calibrated metal plugs.

[0021] The bearing devices for the supporting structure according to the invention can comprise, for example, bases of reinforced concrete and/or steel sections.

Brief Description of the Drawings

[0022] Further characteristics and advantages of the present invention will become clearer from the following description made by way of example with reference to the accompanying drawings, wherein:

- Figure 1 is a schematic view of a supporting structure according to an embodiment of the present invention, installed at a work on which maintenance and/or restoration interventions have to be made;
- Figure 2 is a plan view only of the supporting structure of Figure 1;
- Figure 3 is a plan view of a portion of the supporting structure in Figures 1 and 2;
- Figure 4 is a cross-sectional view of the supporting structure of Figures 1 and 2;
- Figure 4A is a perspective view of a component of the supporting structure according to an embodiment of the present invention;
- Figure 5 is an enlarged view of a detail of the supporting structure of Figure 4;
- Figure 6 is a view in unassembled condition of some of the components depicted in Figure 5;
- Figure 6A is a bottom perspective view of one of the components of Figure 6;
- Figure 7 is a top perspective view of the components depicted in Figure 6 in assembled condition; and
- Figure 8 is a bottom perspective view of the components depicted in Figure 6 in assembled condition.

Detailed description

[0023] Figure 1 schematically shows a supporting structure 10 installed at a work 1, above which the continuity of operation, i.e. the transit of trains on the rails 5 of a railway track, must be guaranteed.

[0024] The supporting structure 10 comprises a plurality of horizontal metal beams 20, 20' arranged parallel to the rails 5 of the track and supported by bearing devices, such as for example reinforced concrete bases and/or steel sections. Each rail 5 is arranged on a supporting element 9, which is fastened to cross saddles 30 of the supporting structure 10.

[0025] In particular, as emphasised in Figures 2 to 4, the supporting structure 10 is formed by two metal assemblies 15 for supporting the respective rails 5. In Figure 4A, an enlarged view of a pad 6 of electrically insulating and vibration-damping material, which is interposed between each supporting element 9 and each rail 5, is depicted. The pad 6 of electrically insulating and vibration-damping material comprises a front flap 7 and a rear flap 8 which protrude downwards, in such a way as to abut against the respective front and rear surfaces of each supporting element 9.

[0026] As depicted in the views of Figures 3 and 4,

each metal assembly 15 comprises a plurality of metal cross saddles 30 fastened to the metal beams 20, 20' in positions comprised between the positions of successive crossbars of the track for the entire length of the beams themselves. The two metal assemblies 15 are joined together by means of metal plates 40, which connect together the metal fins 50 fastened to the metal beams 20' which are arranged at spaced apart and mutually corresponding positions along one side of each metal assembly 15.

[0027] In the enlarged view of Figure 5 and in the unassembled condition view of Figure 6, some of the peculiar characteristics of the supporting structure 10 according to the invention are emphasised. Figures 7 and 8 are instead representations of the components of Figure 6 in assembled condition.

[0028] The metal plates 40 and the metal fins 50 are equipped with through holes in corresponding positions for the mutual fastening by metal bolts 51 coupled to metal nuts 52. A plate 60 made of electrically insulating material is advantageously interposed between each of the metal plates 40 and each of the corresponding metal fins 50 fastened to the metal beams 20'. Moreover, a bushing 65 of electrically insulating material (Fig. 6A) is fitted on each of the metal bolts 51.

[0029] This allows to maintain the electric insulation between the two metal assemblies 15 and, at the same time, to ensure robust mutual fastening therebetween. In order to further guarantee the electric insulation between the two metal assemblies 15, a foil 66 of electrically insulating material is applied to the top surface of all the metal beams 20 and 20'. A material having the desired characteristics of electric insulation can be, for example, a synthetic elastomer, such as Neoprene® or the like, and can optionally be reinforced with an electrically insulating polyester mesh, especially for making the foils 66 applied to the top surfaces of the beams 20 and 20'. The foils 66, in addition to having an adequate thickness, can also undergo a non-slip surface treatment to guarantee greater safety for the personnel operating on the supporting structure 10. As an alternative to the foils 66 made of electrically insulating material, the electric insulation between the two metal assemblies can be made by applying to the top surface of the metal beams a layer of insulating protective paint resistant to high temperatures, which forms a hard and flexible film having high resistance to heat and chemical agents without corrosive effects. The film thus obtained can then be coated with an acrylic enamel.

[0030] To prevent unscrewing of the metal nuts 52 from the metal bolts 51, anti-loosening devices 53 combined with each of the metal bolts 51 are used. One of the devices, which proved suitable for this purpose is for example the locking device identified by the trade name Lock-one®, that is a device which is particularly adapted to resist the vibrations that tend to cause the nuts 52 to be unscrewed.

[0031] Generally, with respect to the supporting structure known from Patent no. IT1255694, the metal beams 20 and 20' of the supporting structure 10 according to the present invention have a "double T" section and are free of reinforcements applied to their base plates.

[0032] The saddles 30, on the other hand, are completely similar to those already known from the previous patent, and comprise a flat portion 31 on which a supporting element 9 for the rail 5 is fastened and two wings 32 arranged perpendicular to the flat portion 31 at its lateral ends.

[0033] The wings 32 are equipped with through holes for fastening the saddles 30 to the metal beams 20 and 20'. The saddles 30 are fastened to the metal beams 20, 20' by calibrated metal plugs 35 inserted in the through holes present on the wings 32. Some strips 36 are fastened by nuts and bolts to the metal beams 20, 20' for holding in position the calibrated metal plugs 35.

[0034] Each of the metal supporting assemblies 15 comprise two pairs of metal beams 20, 20' in turn equipped with through holes. The beams 20 and/or 20' of each pair are arranged side by side with the opposite faces of the wings 32 of the saddles 30 and in close contact therewith.

[0035] Various changes may be made to the embodiments described herein without departing from the scope of the invention defined by the following claims. For example, the supports 2 for the supporting structure 10 can also be made of reinforced concrete and/or consist of steel sections. Moreover, the materials and devices mentioned above by way of example may also vary according to the installation requirements, provided that the characteristics of robustness of the supporting structure and, above all, of electric insulation between the rails 5 are maintained.

Claims

1. A supporting structure (10) for the provisional support of railway tracks, comprising a plurality of horizontal metal beams (20, 20') arranged parallel to the rails (5) of the track, wherein said horizontal metal beams (20, 20') are supported by bearing devices (2), in which two metal assemblies (15) for supporting the respective rails (5) are provided, each metal assembly (15) comprising a plurality of metal cross saddles (30) fastened to said metal beams (20, 20') in positions comprised between the positions of successive crossbars of the track along the entire length of the same beams, as well as means for the mutual fastening of the supporting metal assemblies (15) for the rails (5), which comprise a plurality of metal plates (40), metal bolts (51), metal nuts (52), bushings (65) of electrically insulating material and a plurality of metal fins (50), wherein said metal fins are fastened to said metal beams (20') and are arranged in spaced apart and mutually corresponding positions along one side of each metal assembly (15),

said metal plates (40) and said metal fins (50) being equipped with through holes in corresponding positions for the fastening through said metal bolts (51) coupled to said metal nuts (52), **characterised by** comprising at least one plate (60) of electrically insulating material, which is interposed between each of said metal plates (40) and the corresponding metal fins (50) fastened to said metal beams (20'), and at least one of said bushings (65) of electrically insulating material fitted on each of said metal bolts (51).

2. The supporting structure (10) according to claim 1, further comprising elements (9) for supporting the rail (5), wherein each supporting element (9) is fastened to each of said metal saddles (30) through bolts coupled to respective nuts, and wherein at least one pad (6) of electrically insulating and vibration-damping material is interposed between each supporting element (9) and each rail (5).

3. The supporting structure (10) according to claim 2, wherein said electrically insulating and vibration-damping pad (6) comprises a front flap and a rear flap protruding downwards to abut against the respective front and rear surfaces of a supporting element (9).

4. The supporting structure (10) according to claim 1, wherein a foil (66) of electrically insulating material is applied to the top surface of said metal beams (20, 20').

5. The supporting structure (10) according to claim 1, wherein a layer of electrically insulating protective paint is applied to the top surface of said metal beams (20, 20').

6. The supporting structure (10) according to claim 5, wherein said layer of electrically insulating protective paint is coated with an acrylic enamel.

7. The supporting structure (10) according to any one of the preceding claims, further comprising anti-loosening devices (53) combined with each of said metal bolts (51) to prevent the unscrewing of the respective metal nuts (52).

8. The supporting structure (10) according to claim 1, wherein said metal beams (20, 20') have a "double T" section and are without reinforcements applied to their base plates.

9. The supporting structure (10) according to any one of the preceding claims, wherein each of said metal saddles (30) further comprises two wings (32) perpendicularly arranged to a flat portion (31) at its lateral ends, and wherein said wings (32) are equipped with through holes for the fastening to said metal beams (20, 20').

10. The supporting structure (10) according to claim 9, wherein each of said supporting metal assemblies (15) comprises two pairs of metal beams (20, 20') equipped with through holes, the beams (20, 20') of each pair being arranged side-by-side with the opposite sides of the wings of said saddles (30) and in close contact therewith, wherein said saddles (30) are fastened to said metal beams (20, 20') through calibrated metal plugs (35) inserted in said through holes, and wherein one or more strips (36) are fastened through nuts and bolts to said metal beams (20, 20') for holding in position said calibrated metal plugs (35).

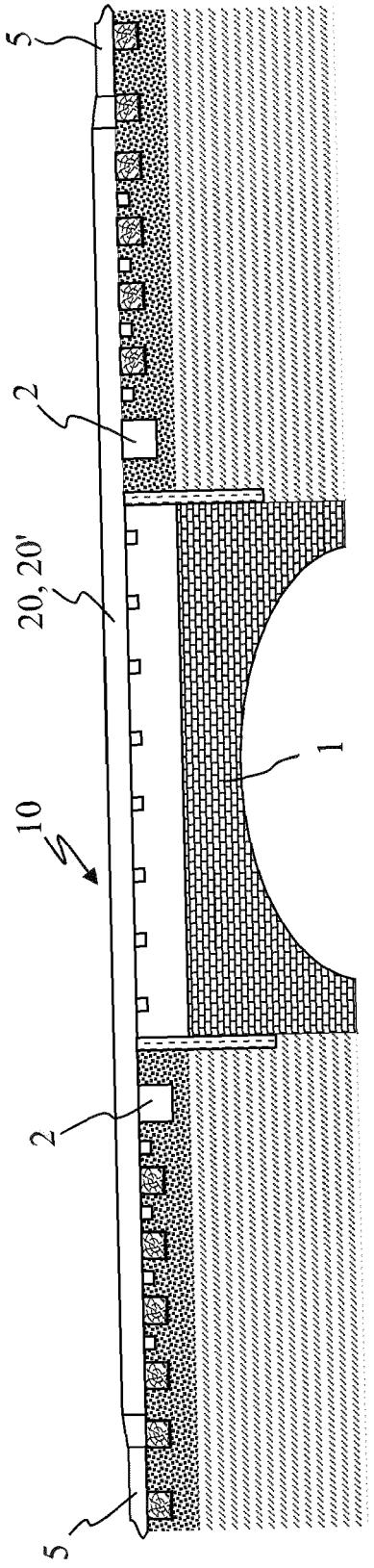

Fig. 1

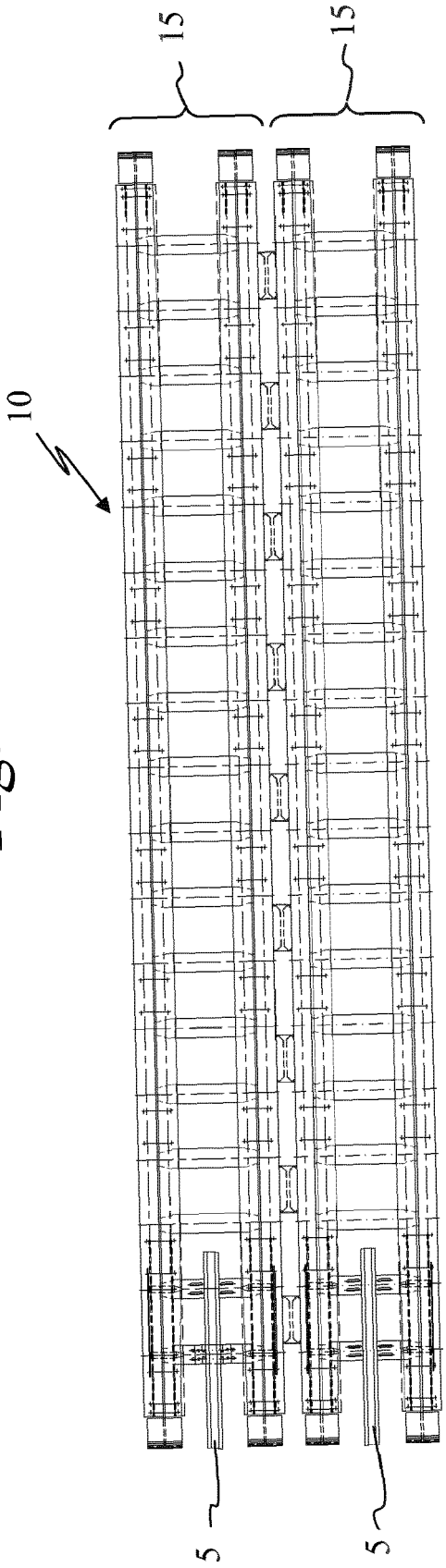

Fig. 2

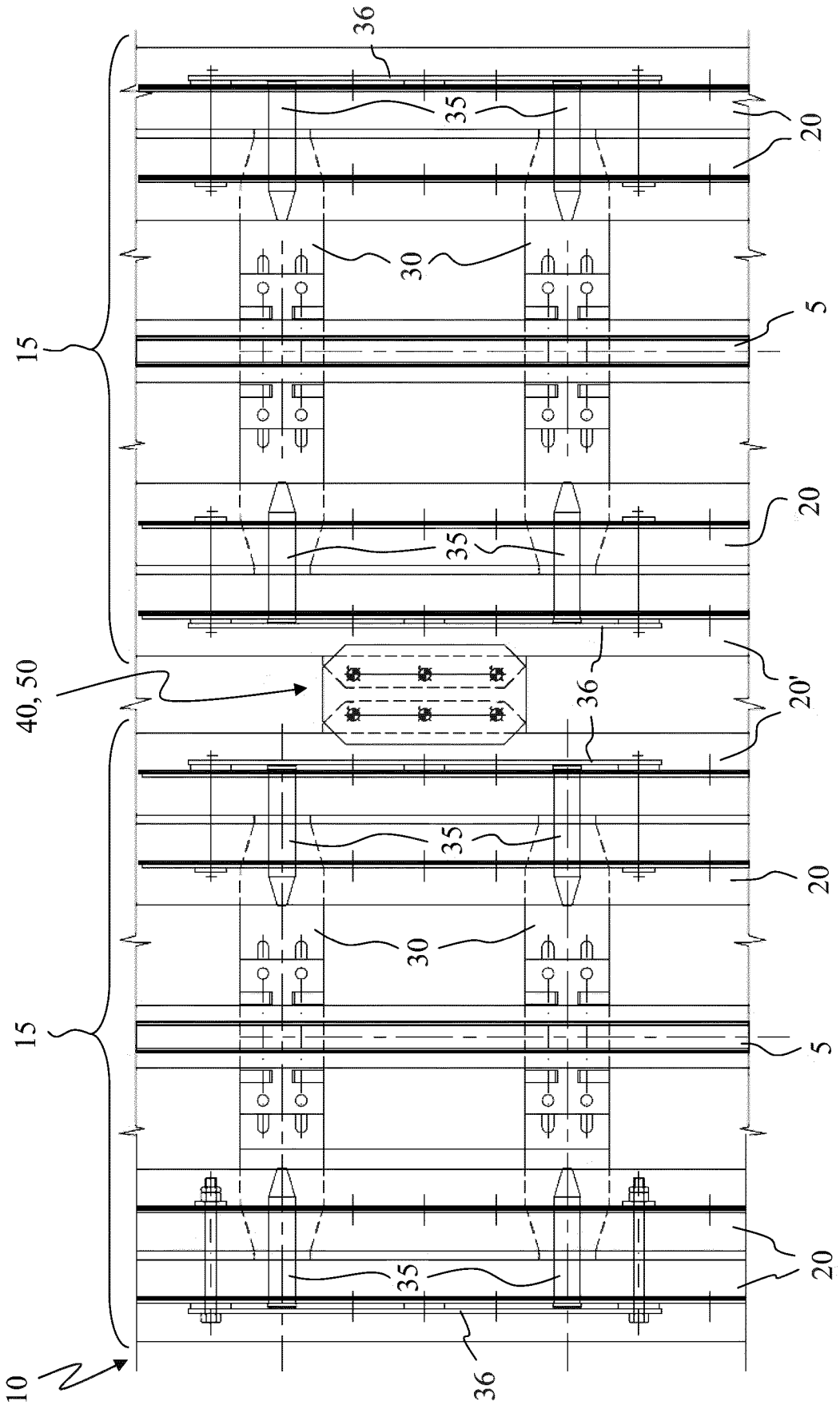

Fig. 3

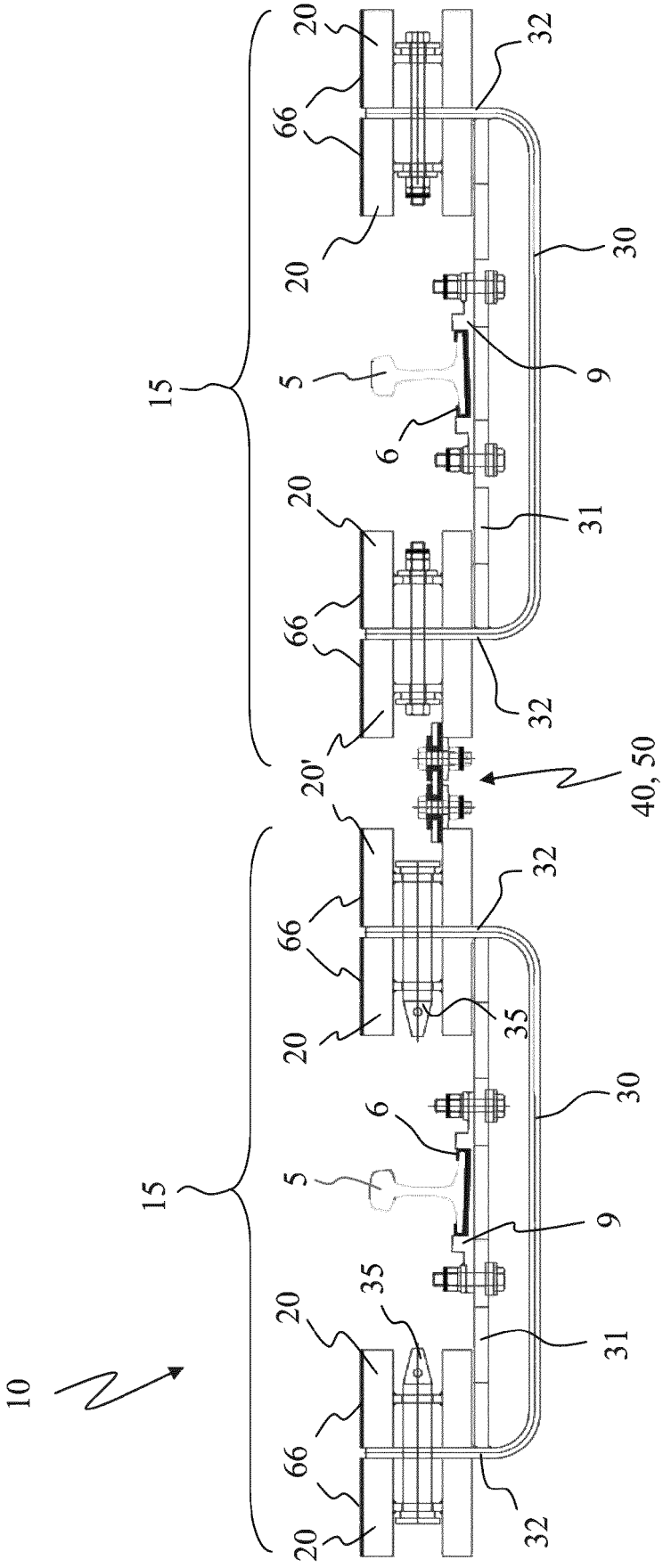
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Fig. 4

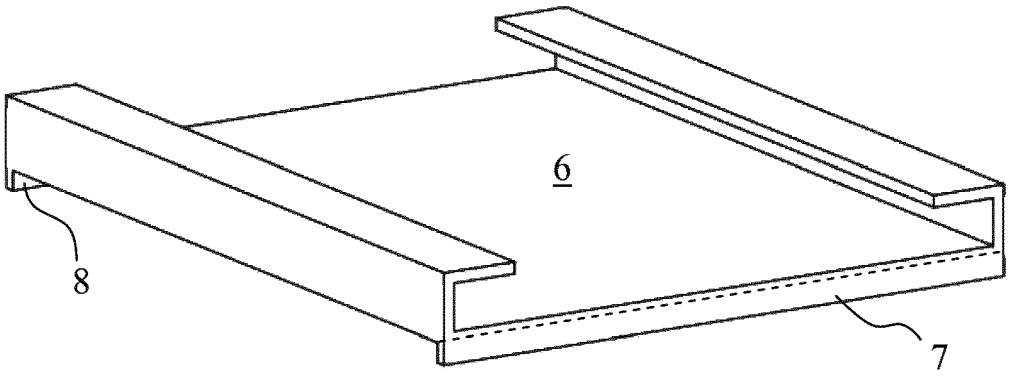

Fig. 4A

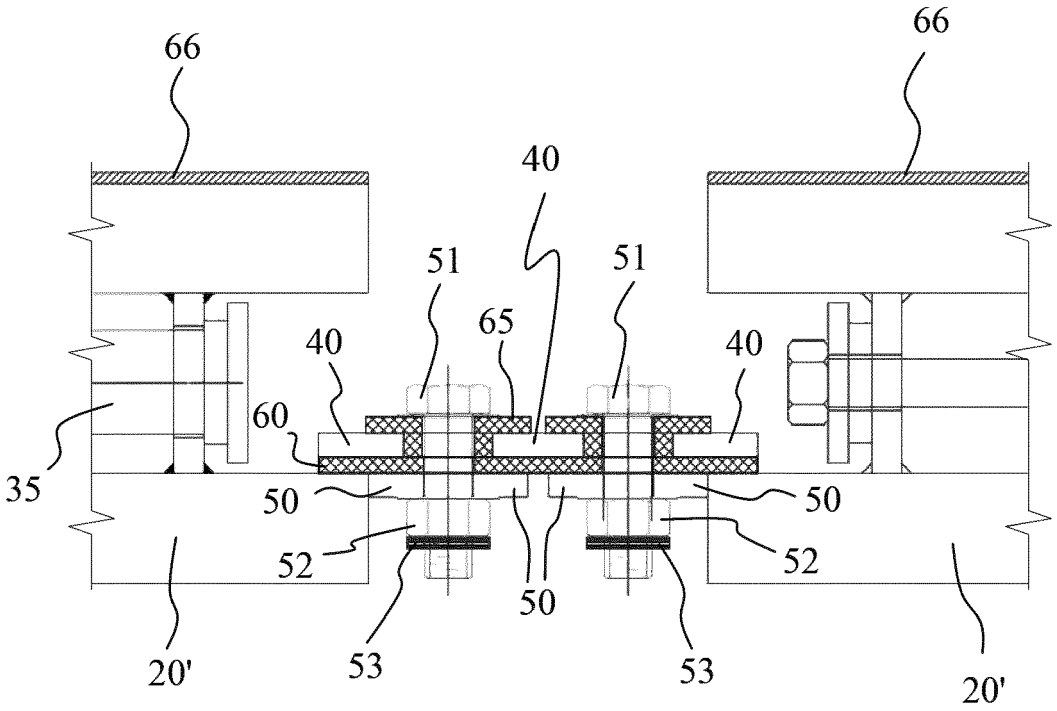

Fig. 5

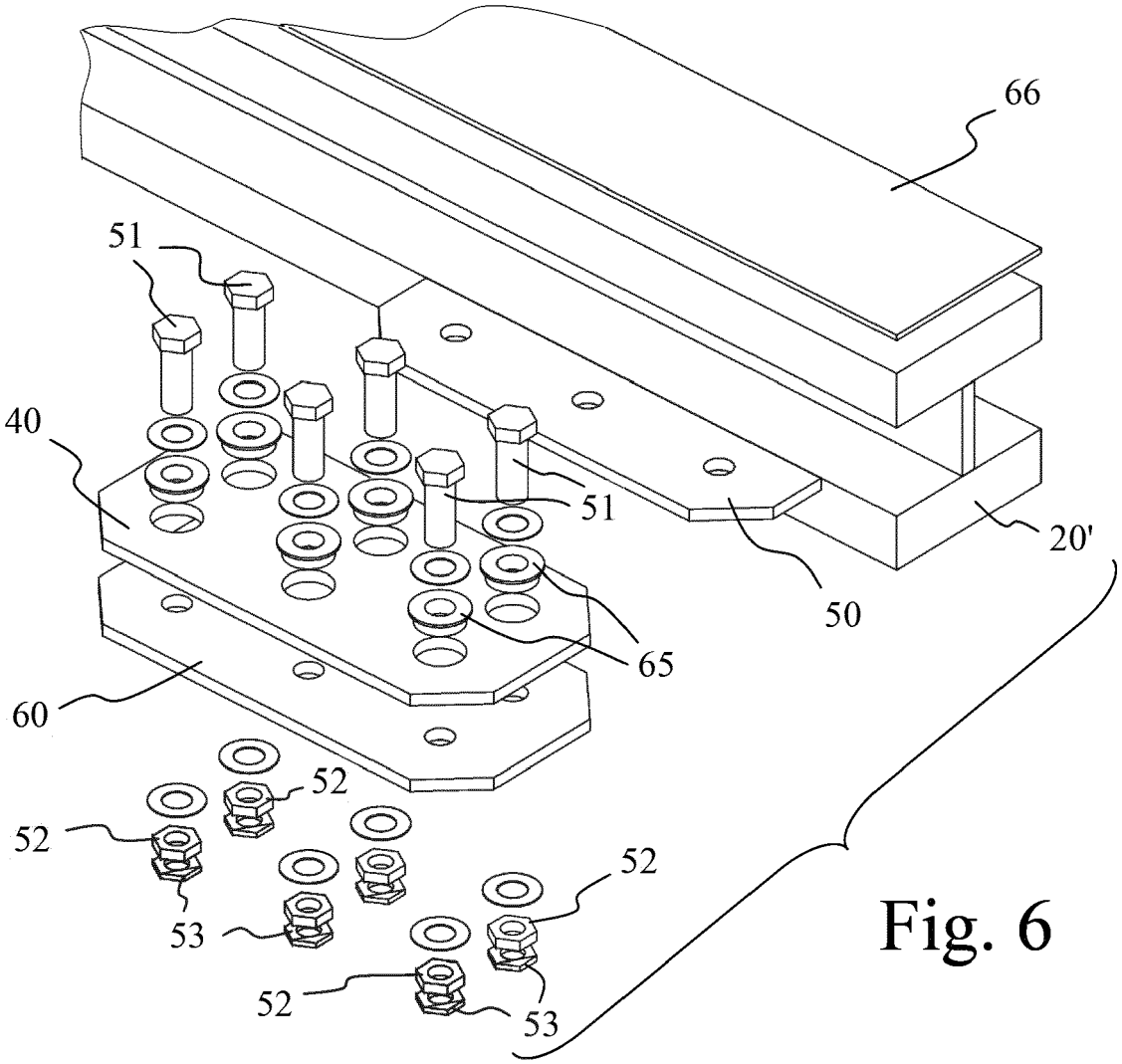

Fig. 6

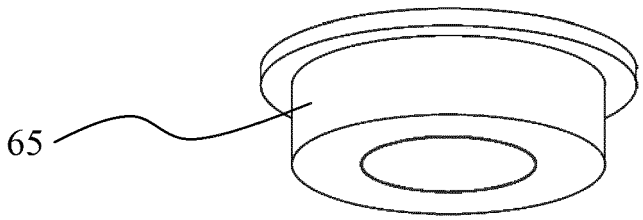

Fig. 6A

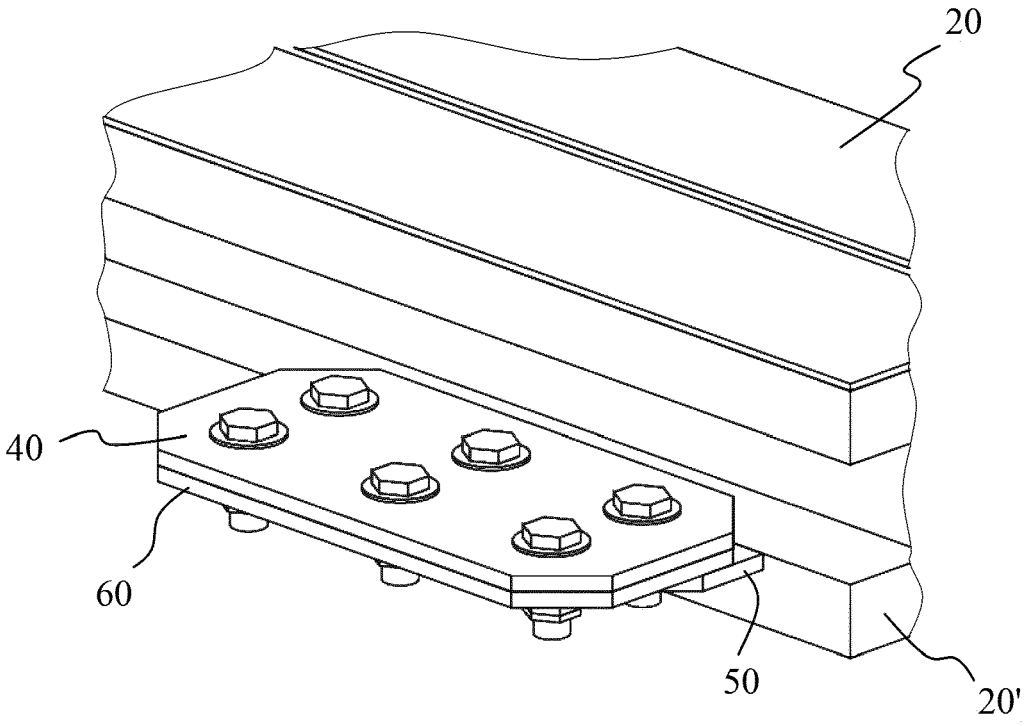

Fig. 7

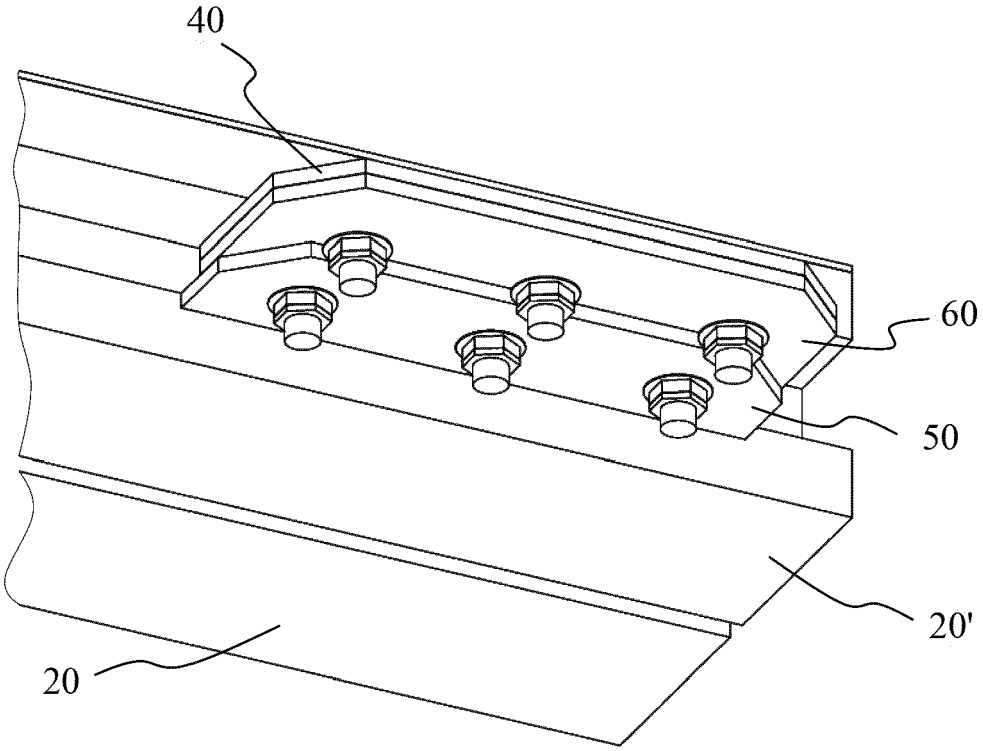

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 21 15 1925

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	IT MI 922 239 A1 (GEOFISICA S R L SOC IT DI) 30 March 1994 (1994-03-30) * the whole document *	1-10	INV. E01B2/00 E01D19/12
A	AT 8 080 U1 (STERN & HAFFERL BAUGESELLSCHAF [AT]) 15 January 2006 (2006-01-15) * abstract; claims 1,6,7 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

E01B
E01D
E21D
E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 March 2021	Movadat, Robin

CATEGORY OF CITED DOCUMENTS

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17-03-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
IT MI922239 A1	30-03-1994	ES 2076111 A2	16-10-1995
		GR 1002581 B	06-02-1997
		GR 930100387 A	31-05-1994
		IT 1255694 B	10-11-1995
AT 8080 U1	15-01-2006	AT 8080 U1	15-01-2006
		AT 505953 A1	15-05-2009

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT MI92A002239 **[0003]**
- IT 1255694 **[0003] [0031]**