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(54) **REBAR CARRIAGE FOR THE CONSTRUCTION OF CONCRETE STRUCTURES**

(57) The present invention refers to a rebar carriage which facilitates rebar placement at the side walls or gables of a concrete structure or a tunnel, previously to concrete pouring. The rebar carriage comprises: a carriage displaceable along a tunnel construction site, and formed by a left-hand side vertical structure, a right-hand side vertical structure and a horizontal structure attached to the side vertical structures. The rebar carriage has a first pair of working platforms extending on a first plane generally parallel to ground, such that one working platform of the first pair is attached to the left-hand side vertical structure, and the other working platform of the first pair is attached to the right-hand side vertical structure. The working platforms of the first pair are extendable and retractable on a plane parallel to ground.

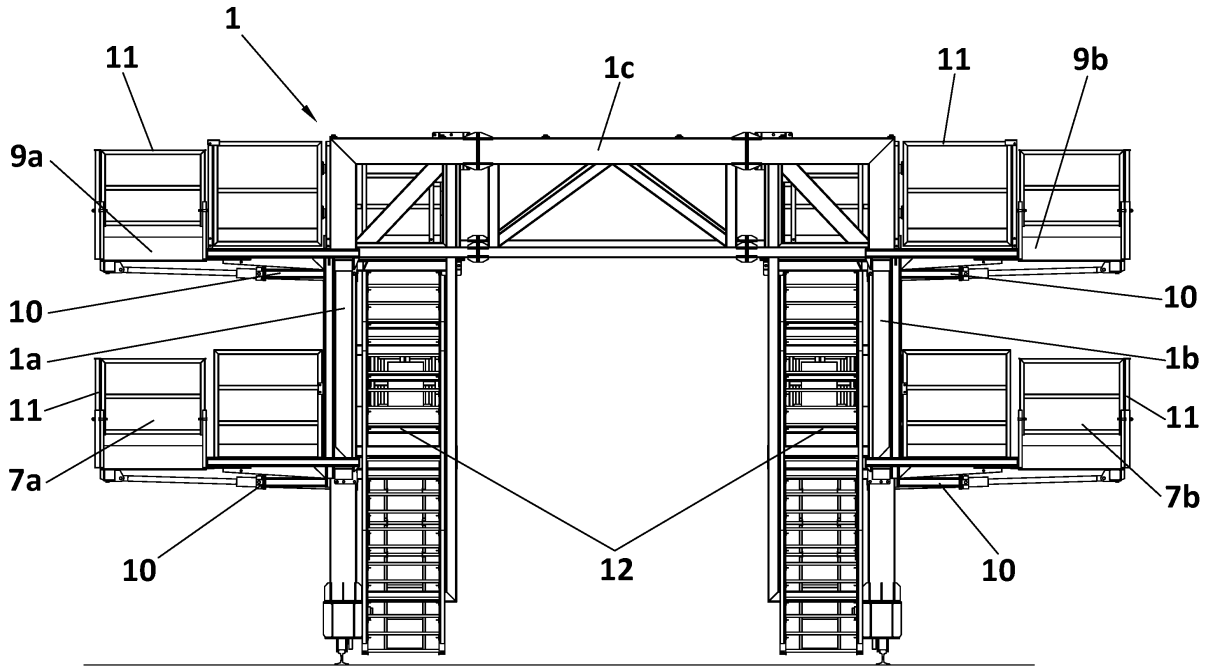

FIG. 2

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Description

TECHNICAL FIELD

[0001] The present invention refers in general to the design and manufacturing of machinery and equipment for the construction of concrete structures, preferably for concrete tunnel lining.

[0002] More in particular, an object of the invention is the provision of a rebar carriage which facilitates rebar placement at the side walls or gables of a tunnel, previously to concrete pouring.

STATE OF THE ART

[0003] In tunnel construction, the excavation has to be lined with a reinforced concrete structure that is in direct contact with the excavation to reinforce it, ensure waterproofing and for aesthetic reasons. To construct the concrete lining, it is first necessary to form a rebar structure, which is then filled with concrete using a formwork to obtain the desired shape of the lining.

[0004] To form the rebar structure at the sides (gables), fixed scaffolding is typically used to allow operators to handle and place the rebar. This process is tedious and cumbersome because the scaffolding has to be frequently repositioned at both sides of the tunnel using cranes, which is a slow and expensive process.

[0005] In addition, the working space inside a tunnel is usually narrow, and the cross-sectional dimensions of a tunnel often vary along the length of the tunnel, which further complicates the process of repositioning the scaffolding.

[0006] As a result, traditional fixed scaffolding has a serious impact on work efficiency, both in terms of the construction efficiency and construction costs.

DESCRIPTION OF THE INVENTION

[0007] The invention is defined in the attached independent claim, and satisfactorily solves the above-described drawbacks of the prior art, by the provision of a rebar carriage for tunnel construction, which comprises a carriage displaceable along a tunnel construction site, and formed by a left-hand side vertical structure, a right-hand side vertical structure and a horizontal structure attached to the side vertical structures, such that the carriage configures a passage in between the side vertical structures for the circulation of vehicles.

[0008] The rebar carriage further comprises a first pair of working platforms extending on a first plane generally parallel to ground, and wherein one working platform of the first pair is attached to the left-hand side vertical structure, and the other working platform of the first pair is attached to the right-hand side vertical structure.

[0009] According to the invention, the working platforms of the first pair are extendable and retractable. Preferably, the working platforms of the first pair are extendable and retractable on a plane generally parallel to ground.

[0010] Thanks to the rebar carriage of the invention, the use of traditional fixed scaffolding and cranes for rebar placement, is avoided. Additionally, the available working area of each platform can be extended when necessary, and the operators can reach tunnels side walls at different distances without need of displacing the carriage laterally.

[0011] The separation distance between the platforms of the first pair with respect to ground, is such that operators can stand and walk on the ground below the platforms of the first pair of platforms.

[0012] Preferably, the rebar carriage comprises a second pair of working platforms extending on a second plane placed above the first plane and substantially parallel to the first plane. Preferably, the working platforms of the second pair are extendable and retractable on a plane generally parallel to ground. The second pair of working platforms facilitates rebar placement at different levels at the side walls or gables of a concrete structure or a tunnel, previously to concrete pouring.

[0013] The separation distance between the first and the second pairs of platforms, is such that operators can stand and walk on the platforms of the first pair of platforms.

[0014] The rebar carriage includes hydraulic cylinders to extend and retract each working platform of the first and second pairs, individually.

[0015] The rebar carriage is fitted with stairs communicating the working platforms of the first and second pair at the same side of the carriage.

[0016] In a preferred embodiment, the rebar carriage has four legs and wherein each leg has at least one wheel to allow the carriage displacement. Preferably, the wheels are driven wheels powered by hydraulic motors, which are suitable to move on railway tracks.

[0017] Alternatively, instead of driven wheels, the self-driven crawler tracks can be used, such that the rebar carriage can travel on a ground without concrete slab.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] To complete the description and in order to provide a better understanding of the invention, a set of drawings is provided. These drawings form an integral part of the description and illustrate embodiments of the invention, which should not be interpreted as restricting the scope of the invention, but just as examples of how the invention can be carried out. The drawings comprise the following figures:

Figures 1 and 2.- show two front views of a rebar carriage according to the invention.

Figure 3.- shows a perspective view of the rebar carriage of the previous figures.

Figure 4.- shows a side view of the rebar carriage of the previous figures.

Figure 5.- shows in figure A the extension capability of each platform. Figure B shows an enlarged detail of the mechanism that allows the extension of the working platforms.

PREFERRED EMBODIMENTS OF THE INVENTION

[0019] **Figures 1** and **2** show two front views of a rebar carriage (1) according to the invention, which is formed by a left-hand side vertical structure (1a), a right-hand side vertical structure (1b) and a horizontal structure (1c) attached at an upper level to the two side vertical structures (1a, 1b), such that the rebar carriage (1) configures a passage (2) in between the side vertical structures (1a, 1b) for the circulation of vehicles (3), such us a track or a cement mixer.

[0020] The rebar carriage (1) has four legs, namely a front pair of legs (4a,4b) and rear pair of legs (4c,4b), wherein each leg has at least one driven wheel (5a,5b,5c,5d) powered by hydraulic motors (not shown), so that the rebar carriage (1) can move on railway tracks (6,6') placed on the ground (8) of a tunnel construction site as shown in the figures.

[0021] Furthermore, the rebar carriage (1) has a first pair of working platforms (7a, 7b) extending on a first plane (X) generally parallel to ground (8). One working platform (7a) of the first pair is attached to the left-hand side vertical structure (1a), and the other working platform (7b) of the first pair is attached to the right-hand side vertical structure (1b). Both working platforms (7a, 7b) of the first pair are extendable and retractable individually on the plane (X) parallel to ground (8).

[0022] The separation distance between the platforms (7a, 7b) of the first pair with respect to ground (8), is such that operators can stand and walk on the ground (8) below the platforms of the first pair of platforms. This working space is intended for tasks to be performed at ground level, such as load movements, pedestrian passage and rebar preparation.

[0023] The rebar carriage (1) also includes a second pair of working platforms (9a, 9b) extending on a second plane (Y) placed above the first plane (X) and substantially parallel to the first plane (X). Similarly, the working platforms (9a, 9b) of the second pair are extendable and retractable individually on the plane (Y) parallel to ground (8).

[0024] Therefore, the rebar carriage (1) of the invention facilitates rebar placement both outside and inside the construction site of a tunnel, and it can even navigate within the tunnel while accommodating vehicle passage.

[0025] As shown in **Figure 1,** the separation distance between the first and the second pairs of platforms (7a, 7b, 9a, 9b), is such that operators can stand and walk on the platforms (7a, 7b) of the first pair of platforms.

[0026] To carry out the extension and retraction of each working platform, each platform (7a, 7b, 9a, 9b) is fitted with hydraulic cylinders (10), which can be operated manually. The extendable working platforms facilitate placement od rebar in multiple layers.

[0027] Additionally, each working platform (7a, 7b, 9a, 9b) is fitted with guardrails (11) at their perimeter, and with stairs (12) communicating the working platforms of the first and second pair at the same side of the rebar carriage (1).

[0028] **Figure 5A** shows an enlarged detail of the mechanism that allows the extension of the working platforms. Each working platform (7a, 7b, 9a, 9b) has an inner platform part (13) permanently fixed to a corresponding side vertical structure (1a, 1b), and a movable part (14) supported by the fixed part (13) and movable on the same plane (X) than the fixed part (13), by means of a rail assembly (15). The fixed part of a hydraulic cylinder (10) is attached to the side vertical structure (1a, 1b), and the extendable arm of the hydraulic cylinder (10) is attached to the movable part (14) of each working platform (7a, 7b, 9a, 9b).

[0029] **Figure 5B** shows in more detail the construction of a rail assembly (15), which is formed by a beam having a H-shaped cross-section, such that wheels coupled to the movable part (14) of each platform, can roll on the lateral channels defined by the H-shaped beam.

Claims

1. Rebar carriage for the construction of concrete structures, comprising:

   a carriage displaceable along a construction site, and formed by a left-hand side vertical structure, a right-hand side vertical structure and a horizontal structure attached to the side vertical structures, such that the rebar carriage configures a passage in between the side vertical structures for the circulation of vehicles,
   a first pair of working platforms extending on a first plane, and wherein one working platform of the first pair is attached to the left-hand side vertical structure, and the other working platform of the first pair is attached to the right-hand side vertical structure, and
   wherein the working platforms of the first pair are extendable and retractable.

2. Rebar carriage according to claim 1, wherein the first pair of working platforms extend on a first plane generally parallel to ground, and are extendable and retractable on a plane generally parallel to ground.

3. Rebar carriage according to claim 1 or 2, further comprising a second pair of working platforms extending on a second plane placed above the first

plane and substantially parallel to the first plane, and wherein the working platforms of the second pair are extendable and retractable.

4. Rebar carriage according to claim 3, wherein the second pair of working platforms extend on a second plane placed above the first plane and generally parallel to the first plane, and wherein the working platforms of the second pair are extendable and retractable on a plane generally parallel to ground.

5. Rebar carriage according to claim 1, wherein the separation distance between the platforms of the first pair with respect to ground, is such that operators can stand and walk on the ground below the platforms of the first pair of platforms.

6. Rebar carriage according to claim 3, wherein the separation distance between the first and the second pairs of platforms is such that operators can stand and walk on the platforms of the first pair of platforms.

7. Rebar carriage according to any of the preceding claims, further comprising hydraulic cylinders to extend and retract each working platform individually.

8. Rebar carriage according to any of the preceding claims, wherein each working platform is fitted with guardrails at their perimeter.

9. Rebar carriage according to any of the claims 3 to 7, further comprising stairs communicating the working platforms of the first and second pair at the same side of the rebar carriage.

10. Rebar carriage according to any of the preceding claims, wherein the carriage has four legs and wherein each leg has at least one wheel to allow the rebar carriage displacement.

11. Rebar carriage according to claim 10, wherein the wheels are driven wheels powered by hydraulic motors, which are suitable to move on railway tracks.

12. Rebar carriage according to claim 10, wherein each leg has a self-driven crawler track.

13. Rebar carriage according to any of the preceding claims, wherein each working platform has an inner platform part permanently fixed to a corresponding side vertical structure, and a movable part supported by the fixed part and movable on the same plane than the fixed part.

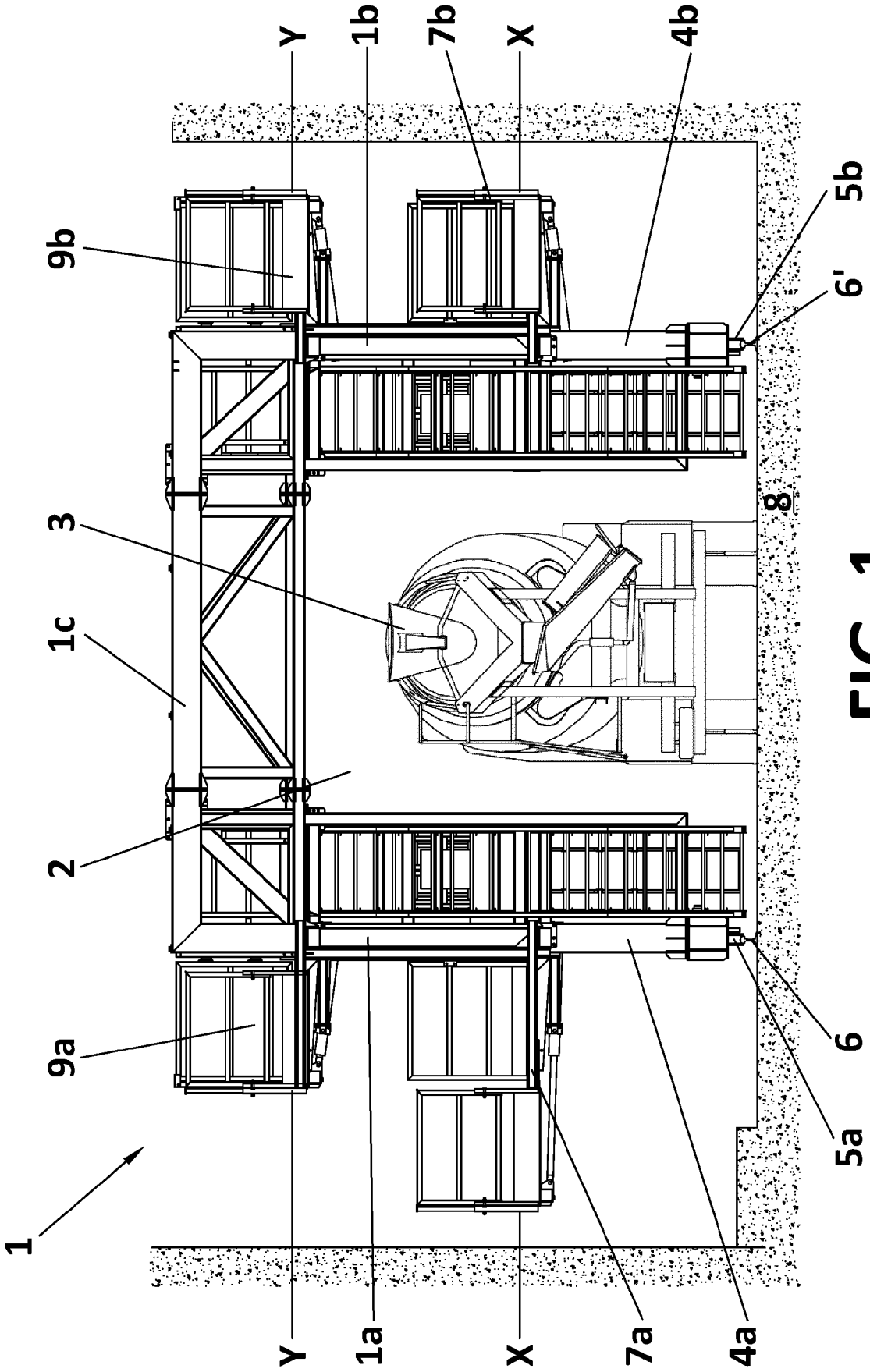

FIG. 1

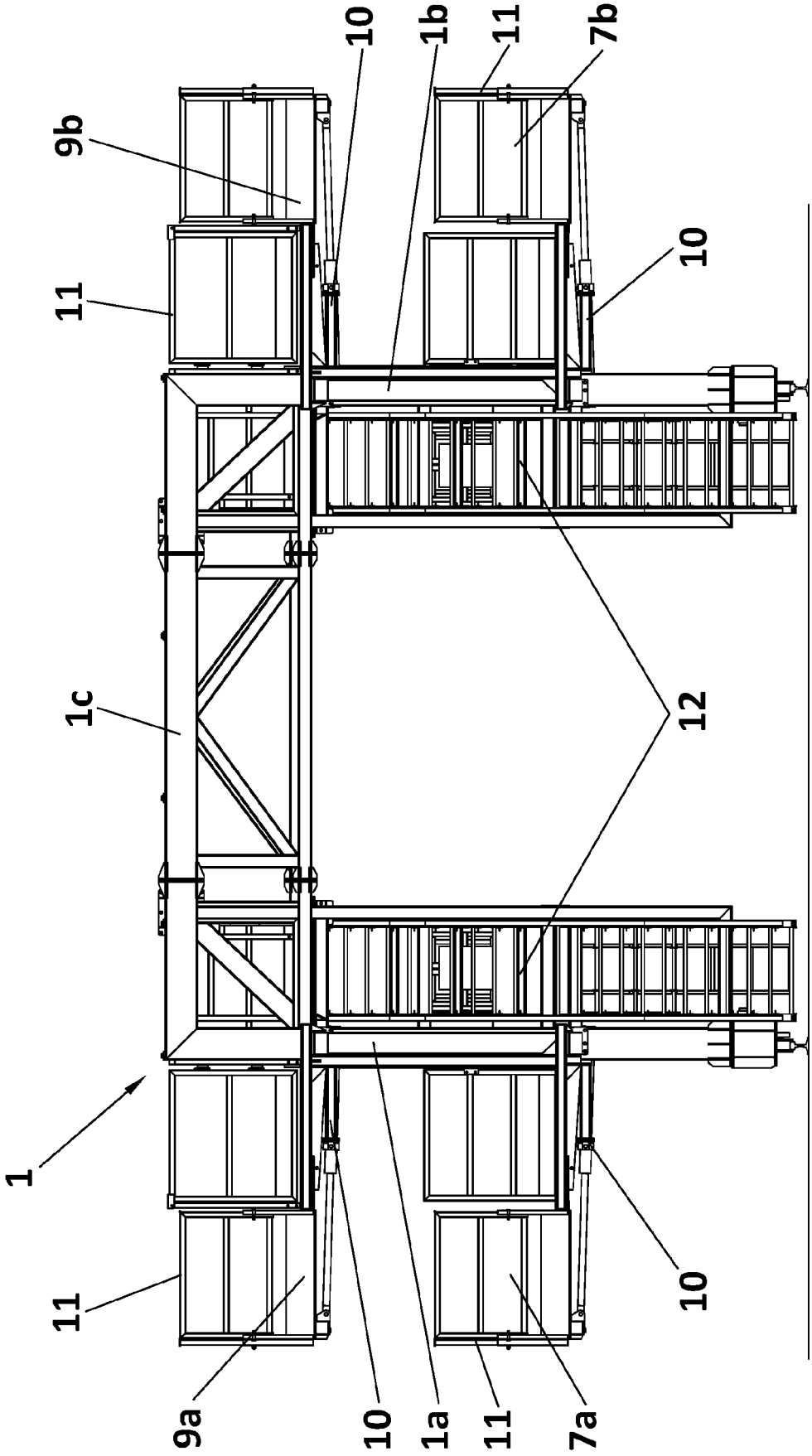

FIG. 2

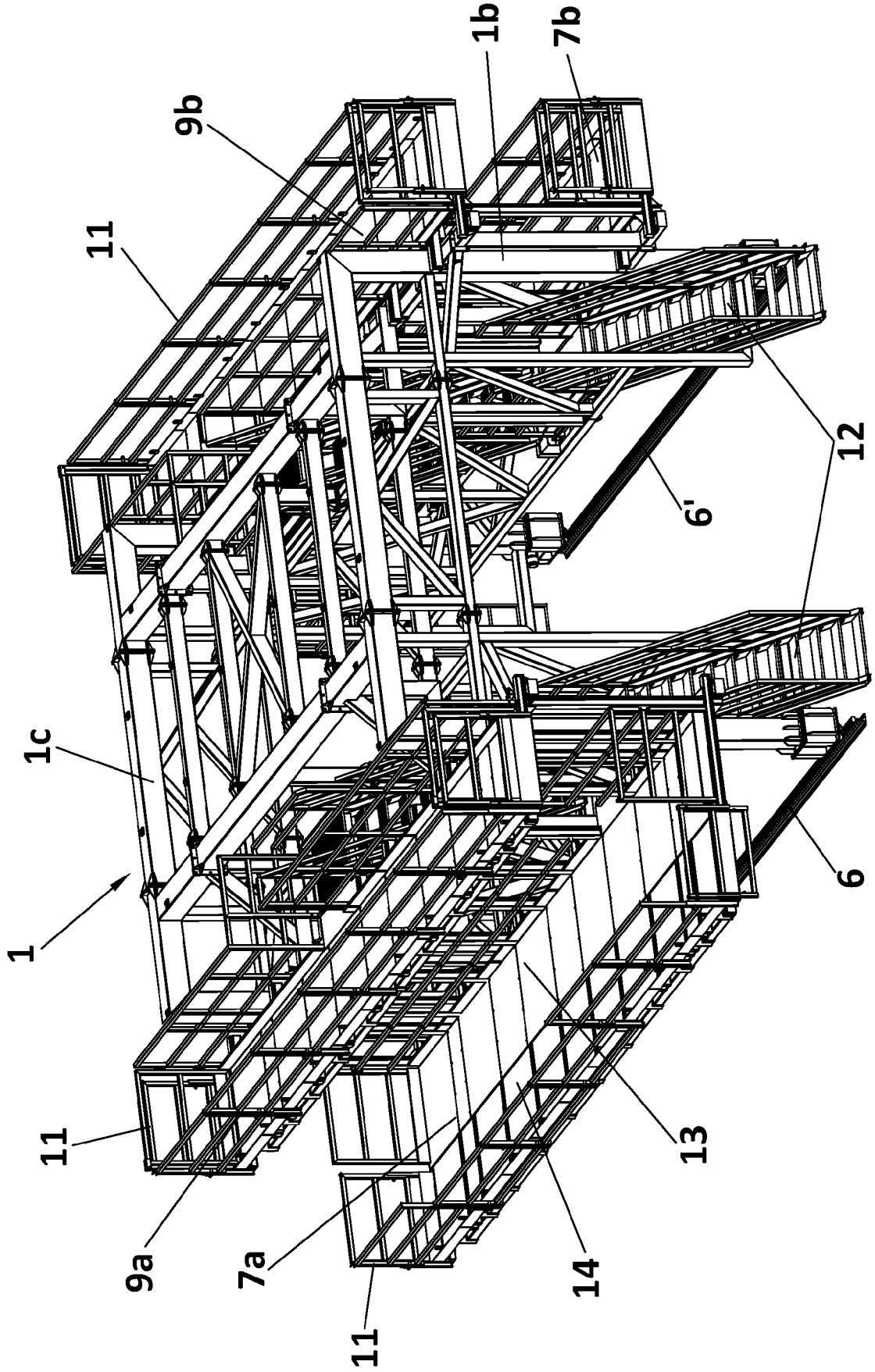

FIG. 3

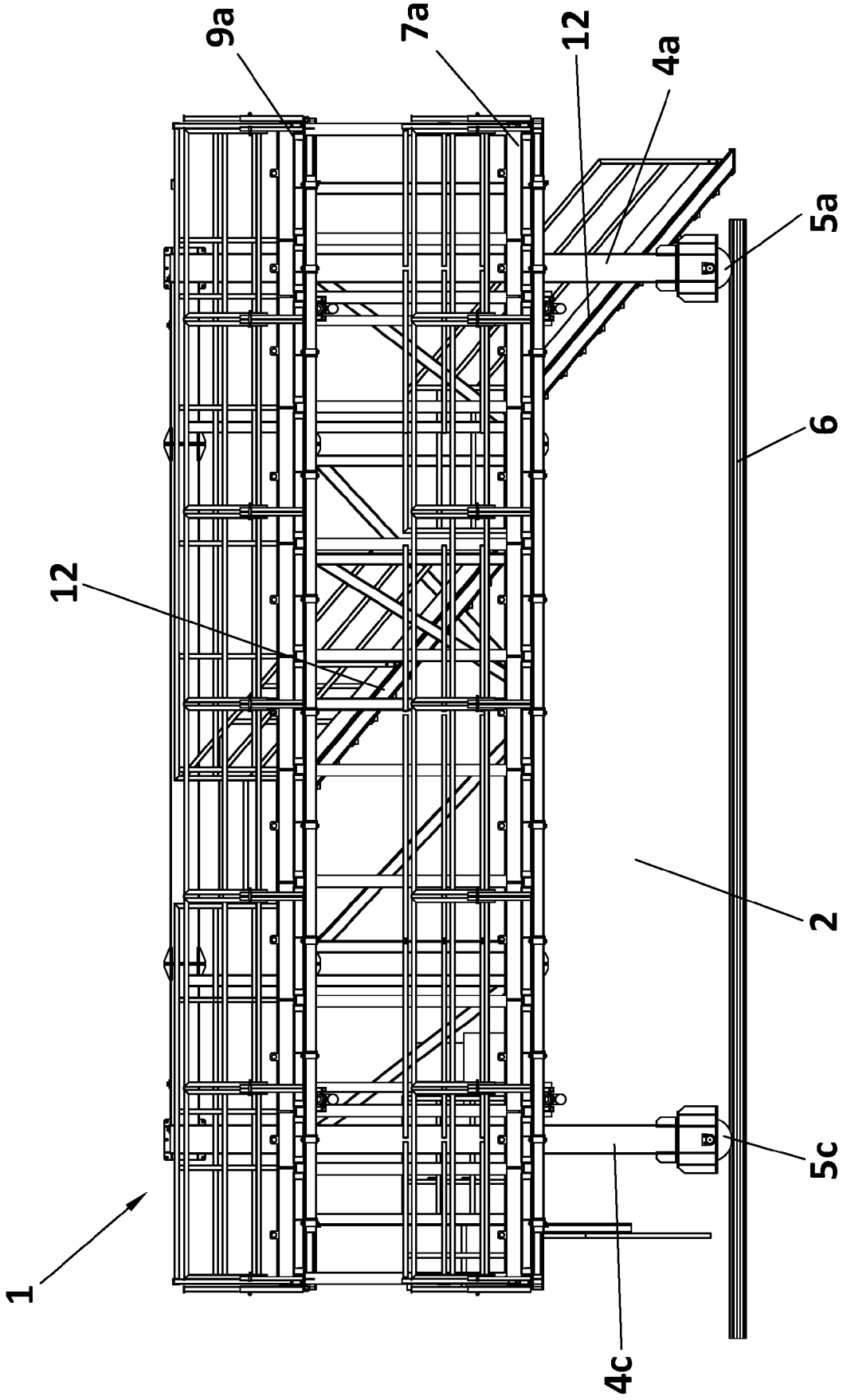

FIG. 4

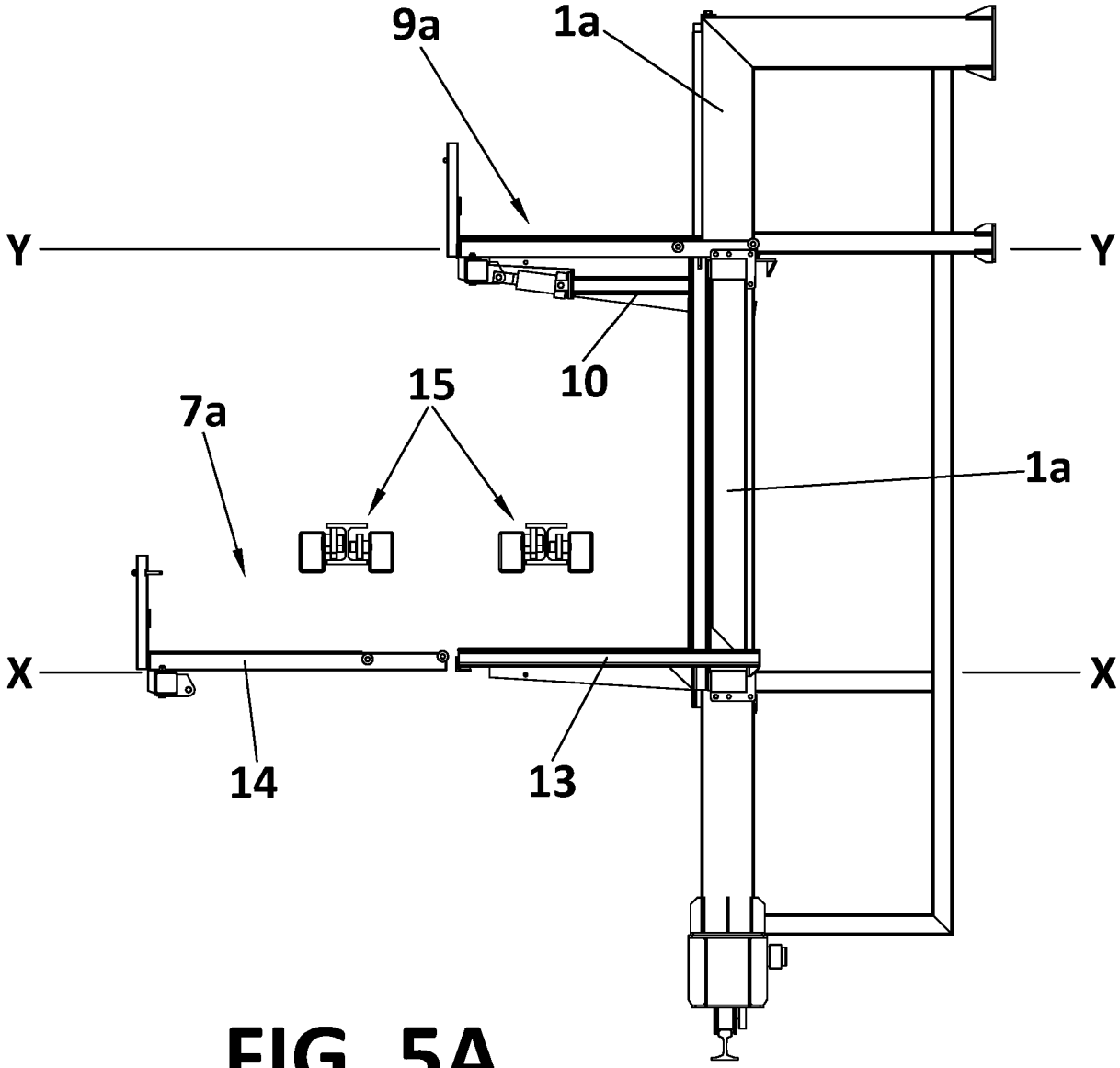

FIG. 5A

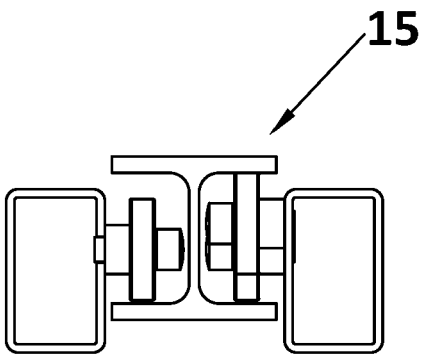

FIG. 5B

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EUROPEAN SEARCH REPORT

Application Number
EP 24 38 2001

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 108 331 603 B (HUNAN WUXIN TUNNEL INTELLIGENT EQUIPMENT CO LTD) 4 July 2023 (2023-07-04)	1-6, 8-10,12, 13	INV. E21D9/12 E21D19/02 E21D19/04 E21D9/01
Y	* see the equivalent passages of the machine translation; paragraphs [0041] - [0076]; figures 1-7 *	7,8, 10-12	
X	CN 211 258 648 U (HUNAN WUXIN TUNNEL INTELLIGENT EQUIPMENT CO LTD) 14 August 2020 (2020-08-14)	1-9,13	
Y	* see the equivalent passages of the machine translation; paragraphs [0008] - [0067]; figures 1-8 *	7,10-12	
X	CN 107 664 041 A (HUNAN WUXIN TUNNEL INTELLIGENT EQUIPMENT CO LTD) 6 February 2018 (2018-02-06)	1-6,9,13	
Y	* see the equivalent passages of the machine translation; paragraphs [0035] - [0067]; figures 1-5 *	7,8, 10-12	
X	CN 207 332 910 U (HUNAN WUXIN TUNNEL INTELLIGENT EQUIPMENT CO LTD) 8 May 2018 (2018-05-08)	1-6,9,13	TECHNICAL FIELDS SEARCHED (IPC) E21D
Y	* see the equivalent passages of the machine translation; paragraphs [0005] - [0055]; figures 1-5 *	7,8, 10-12	
X	CN 108 049 379 A (SINOHYDRO BUREAU 7 CO LTD) 18 May 2018 (2018-05-18)	1-6,9-11	
Y	* see the equivalent passages of the machine translation; paragraphs [0003] - [0052]; figures 1-11 *	7,8	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 June 2024	Brassart, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EUROPEAN SEARCH REPORT

Application Number
EP 24 38 2001

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	JP S54 162825 A (SAGA KOGYO KK; NICHIMEN CO LTD) 24 December 1979 (1979-12-24)	11	
A	* see the equivalent passages of the machine translation; pages 121-122; figures 1-2 *	1-10,12, 13	
Y	CN 110 655 015 B (SINOHYDRO BUREAU 7 CO LTD; UNIV WUHAN) 7 September 2021 (2021-09-07)	11	
A	* see the equivalent passages of the machine translation; paragraphs [0020] - [0077]; figures 1, 7-8 *	1-10,12, 13	
			TECHNICAL FIELDS SEARCHED (IPC)

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 108331603 B	04-07-2023	NONE	
CN 211258648 U	14-08-2020	NONE	
CN 107664041 A	06-02-2018	NONE	
CN 207332910 U	08-05-2018	NONE	
CN 108049379 A	18-05-2018	NONE	
JP S54162825 A	24-12-1979	JP S5822636 B2 JP S54162825 A	10-05-1983 24-12-1979
CN 110655015 B	07-09-2021	NONE	

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