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(54) **TOOL FOR DISMOUNTING TRAVELLERS FOR CONCRETING LARGE ARCHES OF VIADUCTS**

(57) Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3), the type of carriage (2) that is used for concreting the viaduct **characterised by** it including:  
- running gear (5) to move along the viaduct (3) deck (31) in order to move the carriage (2) to one end of the arch (30) as it is lowered,  
- a cross member (6) mounted on that running gear (5),

perpendicular to the deck (31), and with a length greater than the width of the deck (31) so as to project on both sides,

- some bridges for suspending (7) some lateral slings (8), arranged on both sides of the cross member (6) and on both sides of the deck (31) and outside it, and  
- the slings (8), which are fixed to those suspension bridges (7).

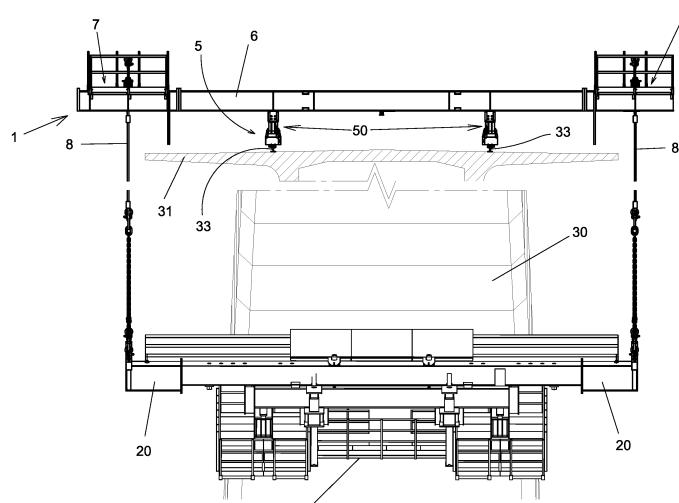


Fig 4

**Description****OBJECT OF THE INVENTION**

**[0001]** The present invention refers to a tool for removing the concreting carriages for large viaduct arches, which can be used in the construction of these civil engineering structures.

**BACKGROUND TO THE INVENTION**

**[0002]** In civil engineering works, for the construction of certain arched viaducts, concreting carriages are used that move along the bottom and side of each arch as it is manufactured as an auxiliary tool to, for example, carry the formwork, which is used in the manufacture in concrete of the arches, and for the assembly and disassembly of all their associated elements.

**[0003]** These carriages are easy to position at the start of the work on the arch, since they are generally at ground level, but once the arch is finished, removing them is a significant logistical problem, due to the great working heights, which, in many cases, are impossible to reach with cranes from below.

**[0004]** This problem is solved with the tool of this invention.

**DESCRIPTION OF THE INVENTION**

**[0005]** The tool for removing the concreting carriages for large viaduct arches of the invention has a configuration that allows it to be dismantled and removed from the deck of the viaduct itself once it is built, with the participation of other conventional auxiliary means (cranes) at a reduced cost.

**[0006]** According to the invention the tool consists of:

- running gear to move along the deck of the viaduct in order to move the carriage to one of the ends of the arch as it descends from it,
- a cross member mounted on that running gear, perpendicular to the deck and of a length greater than the width of that deck such that it projects on both sides,
- some suspension bridges with lateral slings, arranged on both sides of the cross member and therefore on both sides of the deck and outside of it, and
- the slings (cables and/or chains), which are fixed to said suspension bridges,

all this in order to suspend the carriage by lowering it using the slings to different heights, lower each time, and to be able to transport it by means of the running gear to one of the ends of the arch, where it will reach a point where it can be carried from below. In order to be able to position the carriage at different heights, it is necessary to use some means of lowering it, for example, a pair of cranes, each of which will take a side sling and lower it

in synchronisation with the other.

**[0007]** The tool will also include its own means of propulsion or means of coupling to a towing vehicle.

**[0008]** But in addition, it has been found to have the following advantages:

- It eliminates the need to use marine means (barges) on which to deposit the load, once lowered from its position by means of Heavy Lifting equipment or self-propelled cranes (high costs, complicated logistics in interior works - rivers or dams -, low availability of barges, etc.).
- Eliminates the need to use high tonnage crawler cranes for moving the suspended load, so marine methods can be avoided (high cost of transport and assembly of the cranes and low availability of crawler cranes, etc.).
- It provides an option to lower the load to accessible areas in complex ravines, without the need to prepare access routes to the equipment's vertical descent points.

**BRIEF DESCRIPTION OF THE DRAWINGS****[0009]**

Figures 1A, 1B and 1C show a side view of a sequence for use of the tool of the invention, with a first stage shown in fig. 1A, of unhooking the carriage using two cranes that handle the lateral slings, a second stage shown in figure 1B in which the carriage is moved laterally using the movement of the running gear and a third stage shown in fig. 1C in which the slings are lengthened to lower the carriage so that the lateral movement can be continued towards the start of the arch and the carriage can then be removed.

Figures 2A, 2B and 2C show the sequence of Figures 1A, 1B and 1C but in a perspective view.

Figure 3 shows a detailed view of the tool of the invention in a perspective view with an enlarged view of a side area of the cross member so that the corresponding suspension bridge can be appreciated.

Figure 4 shows an elevation view of the tool of the invention.

Figure 5 shows a side view of the tool of the invention.

**DESCRIPTION OF A PRACTICAL IMPLEMENTATION OF THE INVENTION**

**[0010]** The tool of the invention (1) for removing the carriages (2) for concreting the large arches (30) of viaducts (3) is used for removing carriages (2) of the type used for concreting the viaduct (3) (see figs 1 and 2), and

according to the invention it consists of (see fig 3):

- running gear (5) to move along the deck (31) of the viaduct (3) in order to move the carriage (2) to one end of the arch (30) as it is lowered,
- a cross member (6) mounted on that running gear (5), perpendicular to the deck (31), and with a length greater than the width of the deck (31) so as to project on both sides,
- some bridges for suspending (7) (see detail of fig 3) some lateral slings (8), arranged on both sides of the cross member (6) and on both sides of the deck (31) and outside of it, and
- the slings (8) (cables and/or chains), which are fixed to those suspending bridges (7),

**[0011]** With this, it is possible to suspend the trolley (2) by lowering it using the slings (8) to different heights, lower each time, and to move it by means of the running gear (5) towards one end of the arch (30) with the assistance of some means of lowering, which, in this example, is a pair of cranes (100) (see figs 1A, 1B, 1C), each of which will hold one side sling (8) and lower it simultaneously with the others in as many lowering-sideways movement steps as are necessary, depending on the length of the slings (8).

**[0012]** It has been envisaged that the running gear (5) includes brakes to completely immobilise it during the lowering and sling (8) lengthening stages, in order to avoid accidents. As the running gear (5) will ideally comprise bogies (50) arranged under the cross member (6) to move along rails (33) arranged on the deck (31) of the viaduct (3), it is preferred that the brakes consist of blocks, not shown, arranged under said bogies (50) and clamps for fixing said blocks to the rails (33).

**[0013]** For a specific embodiment where the carriage weighs 50 tons and the width of the viaduct deck (31) is 15 metres wide, it is preferable (see fig 3) that the cross member (6) consists of two 18 metre long HEB600 beams (60) separated by 0.900 m, and with transverse ties with diagonals (61) that tie the upper and lower parts together with a maximum spacing of 2.00 m, with the HEB600 beams connected perpendicularly and at the bottom by two 3.00 m reinforced HEB300 beams (62), 6.415 m apart, with two bogies (50), positioned underneath the HEB300 beams, with two wheels 2.65 m apart.

**[0014]** Each suspension bridge (7) may consist of two movable lateral sectors (70) (see detail of fig 3), each of which has a half-cradle (71) to accommodate the end of a pin (72), from which the corresponding lateral sling (8) is suspended (the sectors (70) being movable to allow their separation and to allow the clevis, not shown, of the union between the pin (72) and the sling (8)), and consisting of a safety link between both sectors (70) to prevent their accidental separation. These safety links ideally consist of couplings (66) linked to opposing lugs (67).

**[0015]** The provision of some work platforms (74) with their corresponding guardrails (75) and ladders (76) on

the cross member (6), around or next to the suspension bridges (7) so that the operators can tie the slings to pins, extend the slings, etc.

**[0016]** If the carriage (2) is smaller than the deck (31) (see figs 3 to 5), the tool (1) may be supplemented by means of removable lateral spacers (20) for said carriages (2) of length greater than the distance from the carriage to the corresponding edge of the deck (31) and which is provided with anchors (80) (see fig 5) for the slings (8), to prevent the slings from touching the deck (31) of the viaduct. In the specific example shown in the figures, the supplementary spacers (20) consist of beams (81), eccentric with respect to their connection with the carriage, at whose ends two anchors (80) are arranged for two end brackets (85) of each sling (8).

**[0017]** The tool (1) in this specific embodiment also includes a hitch (77) to a towing vehicle.

**[0018]** Having sufficiently described the nature of the invention, as well as how it functions in practice, it must be stated that the provisions set out above and shown in the accompanying figures may be changed in some details as long as these do not alter the fundamental principle.

## Claims

**1.** Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3), the type of carriage (2) that is used for concreting the viaduct and that consist of:

- running gear (5) to move along the viaduct (3) deck (31) in order to move the carriage (2) to one end of the arch (30) as it is lowered,
- a cross member (6) mounted on that running gear (5), perpendicular to the deck (31), and with a length greater than the width of the deck (31) so as to project on both sides,
- some bridges for suspending (7) some lateral slings (8), arranged on both sides of the cross member (6) and on both sides of the deck (31) and outside it, and
- the slings (8), which are fixed to said suspension bridges (7); **characterised by** each suspension bridge (7) consisting of two movable lateral sectors (70), each of which is provided with a half-cradle (71) to accommodate the end of a pin (72), from which the corresponding lateral sling (8) is suspended.

**2.** Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to claim 1 **characterised by** it including a safety link between the movable lateral sectors (70) of the suspension bridges (7) to prevent their accidental separation.

3. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to claim 2 **characterised by** the safety link consisting of couplings (66) linked to opposing lugs (67) 5

4. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to any of the preceding claims **characterised by** the running gear (5) including brakes. 10

5. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to any of the preceding claims **characterised by** the running gear (5) including bogies (50) arranged under the cross member (6) that move along rails (33) 15 arranged on the deck (31) of the viaduct (3).

6. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to claim 5 **characterised by** the brakes consisting of blocks arranged under the bogies (50) and clamps for fixing said blocks to the rails (33). 20

7. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to any of claims 5 or 6 **characterised by** the cross member (6) consisting of two HEB600 beams (60) of 18 metres in length 0.900 m apart, and with transverse ties with diagonals (61) that tie the upper and lower parts together with a maximum spacing of 2.00 metres, with the HEB600 beams being connected perpendicularly and at the bottom by two 3.00 metre reinforced HEB300 beams (62), 6.415 metres apart, with two bogies (50), positioned underneath the HEB300 beams, with two wheels 2.65 m apart. 25 30 35

8. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to any of the preceding claims **characterised by** including work platforms (74) arranged on the cross member (6), around or next to the suspension bridges (7). 40

9. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to any of the preceding claims **characterised by** including some removable lateral spacers (20) for the carriages (2), longer than the distance from the carriage to the corresponding edge of the deck (31) and provided with anchors (80) for the slings (8), to prevent the slings touching the deck (31) of the viaduct. 45 50

10. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to claim 9 **characterised by** the supplementary spacers (20) consisting of beams (81) eccentric with respect to their connection with the carriage, at the ends of which two anchors (80) are arranged for two 55

end brackets (85) of each sling (8).

11. Tool (1) for removing carriages (2) used for concreting the large arches (30) of viaducts (3) according to any of the preceding claims **characterised by** including a hitch (77) to a towing vehicle.

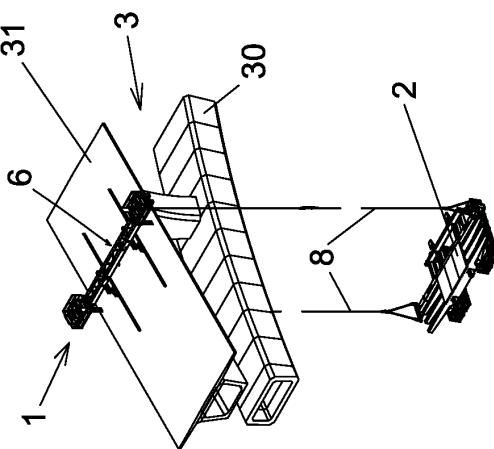
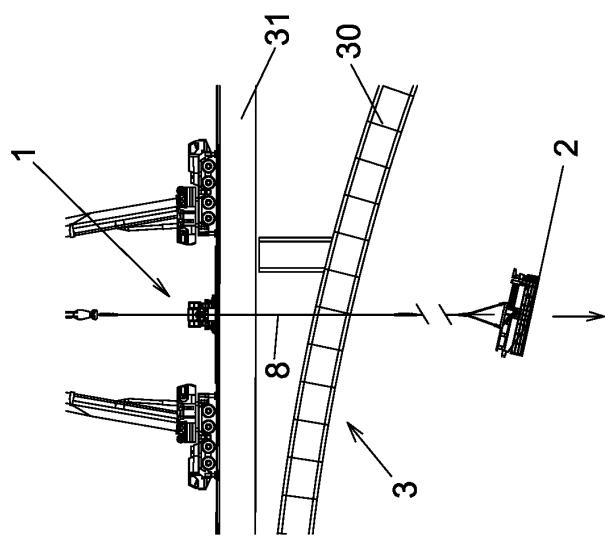


Fig 1

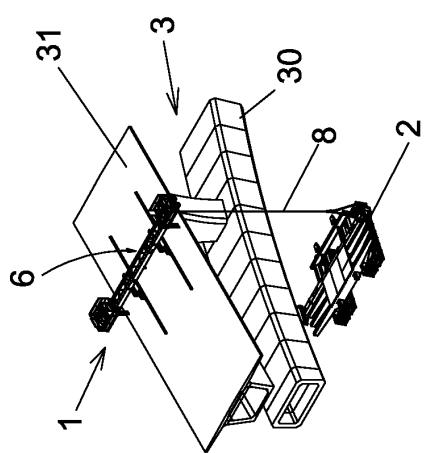
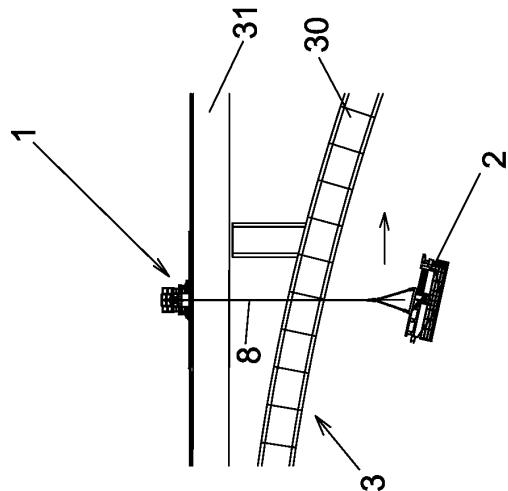
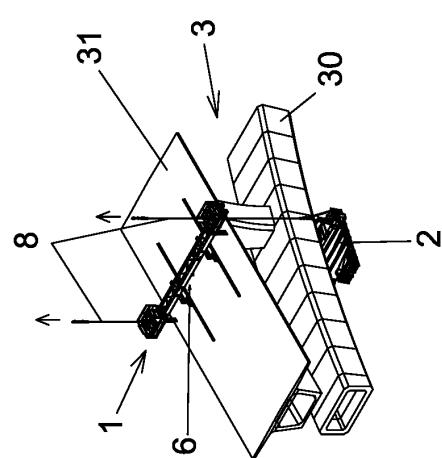
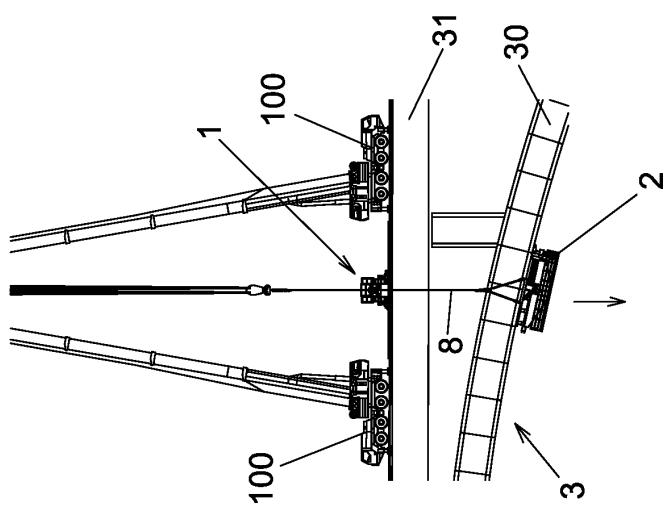


Fig 2



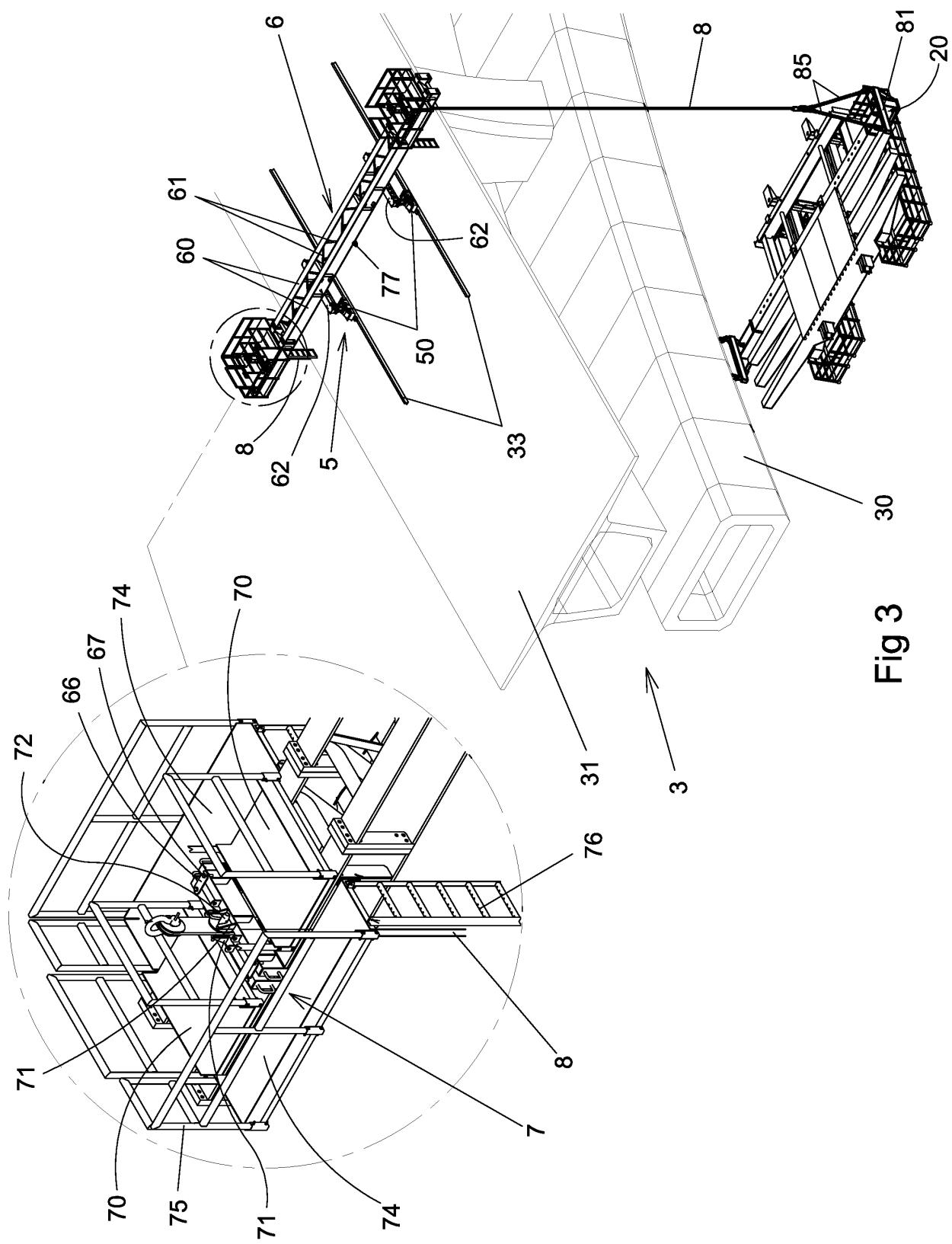


Fig 3

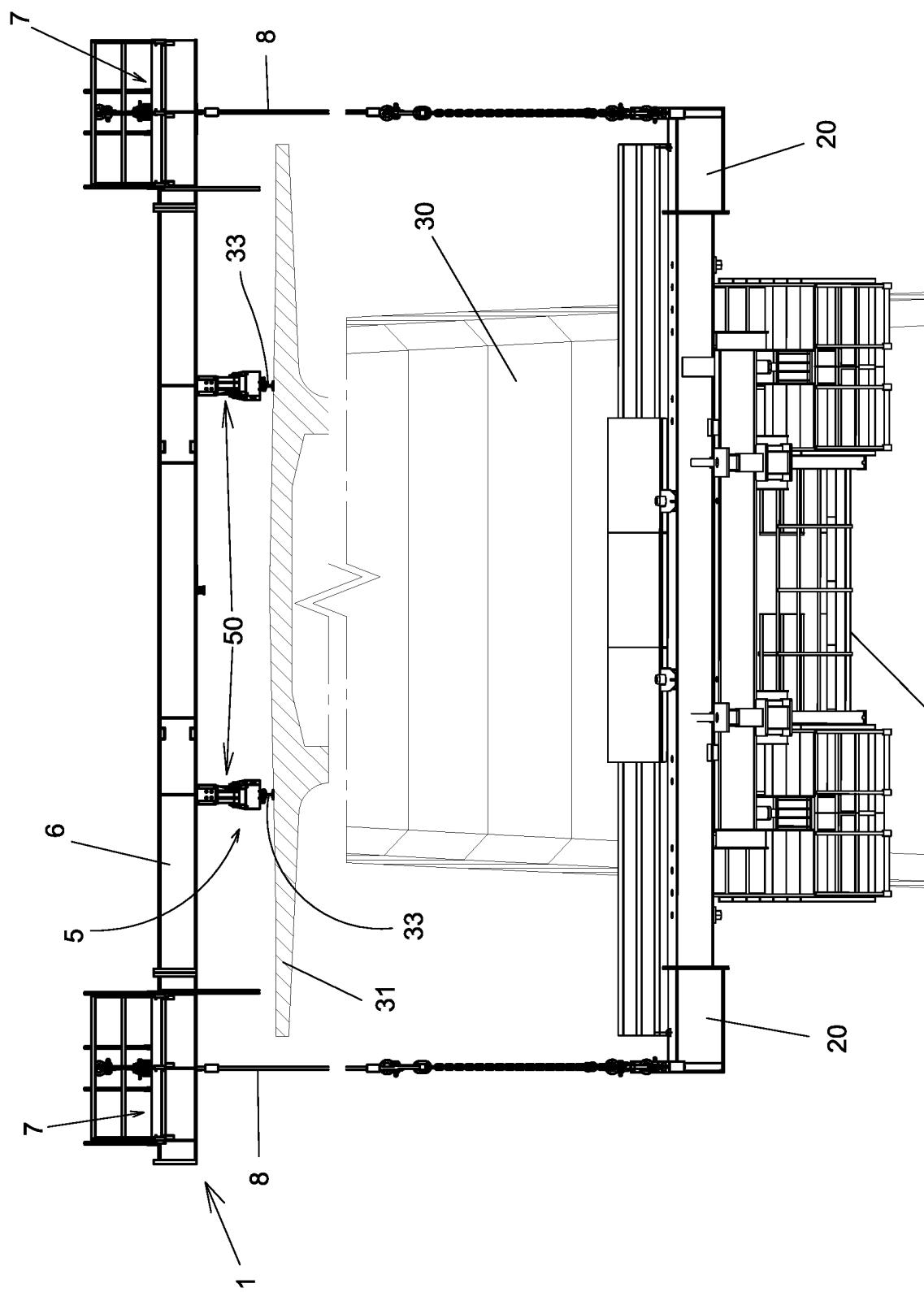


Fig 4

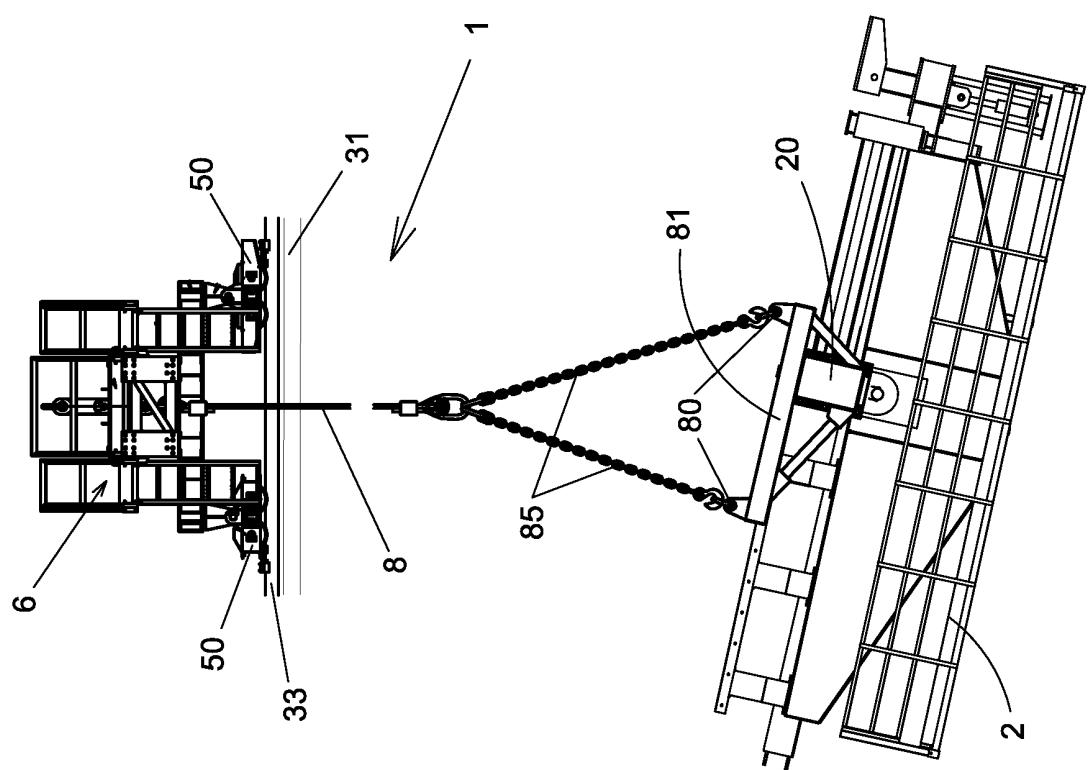


Fig 5

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/ES2019/070288

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## A. CLASSIFICATION OF SUBJECT MATTER

*E01D21/00* (2006.01)*B66C19/00* (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

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## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
E01D, B66C

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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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

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	ADAO DA FONSECA; "THE INFANT DOM HENRIQUE BRIDGE OVER THE RIVER DOURO, AT PORTO"; ARCH'07 5th CONFERENCE ON ARCH BRIDGES; 12-14/09/2007	1-12
A	KR 101259031B B1 (CONTEK ENC) 29/04/2013, & Abstract from DataBase EPODOC. Retrieved of EPOQUE; AN KR-20120114516-A; figures 2 - 4.	1-12
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 Further documents are listed in the continuation of Box C. See patent family annex.

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* 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.		
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Date of the actual completion of the international search 15/01/2020	Date of mailing of the international search report (21/01/2020)
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 R. Puertas Castaños  Telephone No. 91 3498509

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## INTERNATIONAL SEARCH REPORT

International application No. PCT/ES2019/070288
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C (continuation).		DOCUMENTS CONSIDERED TO BE RELEVANT
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10	A KR 20150134694 A (KIM NAM YUL ET AL.) 02/12/2015, & Abstract from DataBase EPODOC. Retrieved of EPOQUE; AN KR-20140061781-A; figure 3.	1-12
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## Information on patent family members

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