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

(11) **EP 2 915 768 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.09.2015 Bulletin 2015/37

(51) Int Cl.:
B66C 19/00 *(2006.01)* ***B66C 19/02*** *(2006.01)*

(21) Application number: **15000615.3**

(22) Date of filing: **03.03.2015**

(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
Designated Validation States:
MA

(30) Priority: **04.03.2014 IT PD20140050**

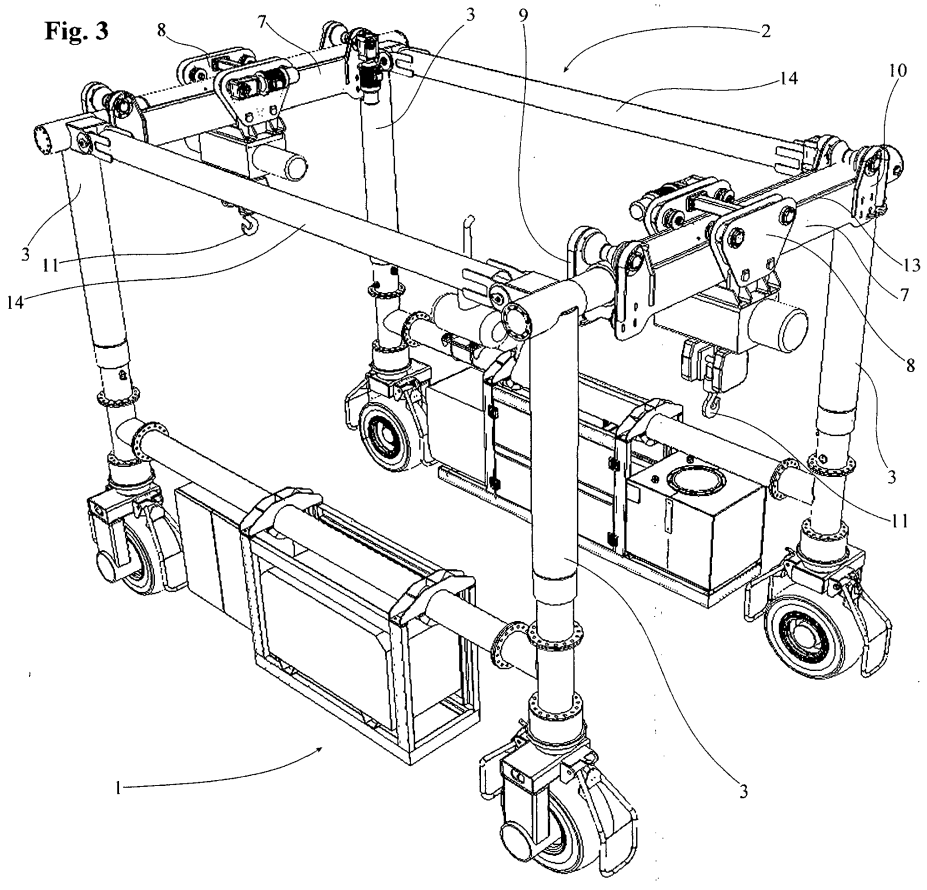
(71) Applicant: **Step Technology s.r.l.**
35019 Onara di Tombolo (IT)

(72) Inventor: **Bonamin, Stefano**
35019 Tombolo (PD) (IT)

(54) **Portal crane**

(57) This invention concerns a bridge gantry crane of the wheeled variety, which is capable of varying its track to make use of its extendable frame [**2**], from the minimum to the maximum, for lifting loads.

Fig. 3



EP 2 915 768 A1

Description

[0001] The field of the invention involves the wheeled gantry bridge crane sector.

Prior art

[0002] All manufacturing companies need to be equipped with a bridge crane on their own production sites.

[0003] Usually this requirement can be easily resolved inside their own industrial sheds using the load-bearing structure of the building itself, but it is not so simple as regards the accessories and the adjoining yards.

[0004] Naturally the situation has been for the most part resolved with the use of bridge cranes supported by gantries or bridge cranes on rickety structures (gantry lame cranes).

[0005] These structures are fixed to slide on fixed tracks inserted into the ground.

[0006] Since the yards, and the relative requirements for moving inside these yards, can be quite vast, it is clear that it is very expensive to equip such surfaces efficiently, in addition to the fact that a series of parallel gantries do not meet the demands of productivity.

[0007] For this reason, very often we can find in these huge yards wheeled portal structures that effectively provide the free movement of the products. These gantry structures have also proven to be effective because of many other characteristics, like for example overcoming slight inclines, a limited variation of the track.

[0008] Moreover, the structure practically imitates the layout of the gantry structures that slide on tracks, with the difference being that the legs have wheels that swivel around its axis and steering.

[0009] On one, or on both, a pair of parallel girders joining the legs is applied the carriage with a hoisting hook.

[0010] Sometimes on the gantry structure, with both sides joined by box girders, another mobile beam on a carriage moves above a pair of joining beams.

[0011] Said carriage can run along the entire runway beam.

[0012] To further increase the versatility of the boxed runway girder, it is telescopic, allowing the carriage to be able to change the wheelbase of the structure.

[0013] The hook carriage continues to slide on the outside of the boxed runway girder but it cannot, given the different size of the cross-section, slide on the telescopic extension of the joining girder. Sometimes this necessitates lifting the loads where the cord of the hoisting hook is not vertical, but inclined.

[0014] Because of the low height of these structures, the inclination of the cable is a cause of wear or breakage of the cord.

Presentation of the invention

[0015] The main object of this invention is to make available a gantry bridge crane that can overcome all the drawbacks of the prior art. An important object of this invention is to make available a wheeled gantry bridge crane that can easily vary the wheelbase/track for moving the load.

[0016] A further object of this invention is to make available a wheeled gantry bridge crane that can exploit the entire extension of the wheelbase/track.

[0017] Another object of this invention is to make available a wheeled gantry bridge crane that can easily lift loads even in an inclined direction.

[0018] All the above-mentioned objects are achieved with the gantry bridge crane whose main feature is the specificity of the principal claim.

Exposition of the invention

[0019] All the above-mentioned objects, as well as others that will appear below, are achieved with a gantry bridge crane that includes an extendable frame equipped with a first girder connected in a moveable manner to a second girder to vary, based on the degree of connection, the track of said crane, and at least one mobile carriage with a lifting hook, where said mobile carriage slides on a main carriage fitted with at a first end with a first joint with the first girder, and a second end with a second joint with the second girder.

Advantageous features of the invention

[0020] Advantageously said main carriage has a length of about half the first girder, allowing the hook to be positioned for lifting, following the shifting and/or on the main carriage on the girders of the frame and/or the smaller carriage on the main carriage for the entire extension of the track of the gantry crane.

[0021] Very usefully at least said first girder or at least said second girder is of the box girder variety.

[0022] In particular, and preferably, said first girder or at least said second girder has a circular cross-section.

[0023] Another advantage is that the mobile coupling between said first girder and said second girder is telescopic in nature, making the system simple, safe and reliable and requiring little maintenance. Another advantage comes from the adoption of a coupling between said first and said second girder is coaxial in nature, thereby facilitating the extension in alignment.

[0024] It is very important that the cross-section of the first and second girder is circular, making it easy to install and in combination with special supports of the carriage also allowing the carriage itself to rotate around the vertical for lifting loads with the cord of the hook inclined, without this resting or scraping against the structure of the girder or getting worn because of the erroneous inclination angle.

[0025] Advantageously the resistant section and the moment of inertia of the circular girders are identical for any orthogonal stress on the main axis of the girders themselves.

[0026] Advantageously the support points of the main carriage on the circular-section girders are rollers with integrated concavities in the middle with a semi-circular generatrix that allow the main carriage to move along the axis of the circular-section girders and to vary the rotation of the main carriage by modifying the inclination of the pull angle of the load hook cable.

[0027] Beneficially said rollers have a concave shape complementary to the cross-section of the girders.

[0028] A further advantage, regarding safety, comes from the fact that said rollers are in a pair diametrically opposite the respective girders, in no way allow decoupling, jolts or slipping. Advantageously from what has been set out above, the travel of the carriage on the girder of the frame and of the smaller carriage on the main carriage is practically equal to the minimum to the maximum travel of the telescoped part of the circular-section or boxed girder on the circular girder or boxed girder of the frame. All the above-mentioned methods of implementation have the advantageous features shown above, without for this reason limiting the scope of protection, which generally can be understood within the definition of the invention in its essential features.

Brief description of the drawings

[0029]

Fig. 1 shows the prior art.

Fig. 2 shows another view of the prior art.

Fig. 3 shows a perspective view of the gantry crane that is the object of the invention.

Fig. 4 shows a side plan view of the gantry crane in a compact situation and a minimum track, with a contracted arrangement of the coaxial telescoped girders retracted one inside the other.

Fig. 5 shows a plan view from above of the object of fig. 4, with highlighted the possibility that on an opposing pair of girders connecting the legs there is a smaller carriage with a hook for lifting the load.

Fig. 6 shows a side plan view of the gantry crane with an extended arrangement with a widened track with an expanded layout of the coaxial telescoped girders extracted one from the other.

Fig. 7 shows a plan view from above of the object of fig. 6, with the main carriage shown supported at its ends, the first on the first girder element, and the second on the second girder element.

Fig. 8 shows the main carriage completely at the end of one side of the girder of the frame, in particular with a first support at the junction of the smaller section girder with the frame, and with the second opposite support at the free part of the girder with the larger cross-section.

Fig. 9 shows the object of fig. 8 with the smaller lifting carriage positioned on the main carriage all shifted to the left.

Fig. 10 shows the main carriage completely at the opposite end to what is shown in fig. 7, namely at the opposite side end of the girder of the frame, in particular with the first support at the exit of the girder with the smaller section than the larger one, and with the second support at the girder with the larger section with the frame.

Fig. 11 shows the object of fig. 10 with the small lifting carriage positioned on the main carriage, but all shifted towards the left, namely on a second end of the main carriage, the opposite to that of fig. 9.

Fig. 12 exemplifies the possibility of moving the smaller carriage on the main carriage when the track of the gantry crane is limited to the minimum, with the maximum insertion of the smaller section girder inside the girder with the larger section.

Fig. 13 exemplifies the possibility of moving both the smaller carriage on the main carriage, as well as the main carriage on the telescoped girder of the frame, when the track of the gantry crane is extended to its maximum with the maximum extraction of the girder with a smaller section from the girder with the larger section.

Fig. 14 shows a cross-section of what is shown in fig. 12 where we can appreciate the telescoped joint between the two girders that make up the telescoped girder of the frame, and we can check the points of support of the main carriage, one always on the girder with the larger section and the other always on the girder with the smaller section.

Fig. 15 shows a cross-section of what is shown in fig. 13, where we can appreciate the telescoped joint between the two girders that make up the telescoped girder of the frame and see the points of support of the main carriage, one always on the girder with the larger section and the other always on the girder with the smaller section.

Figs. 16, 17 and 18 show respectively a perspective view, a side plan view and a plan view from above of the main carriage with the guides for moving the small carriage and the support ends fitted with grooved rollers highlighted.

Fig. 19 and fig. 20 show a cross-section of the grooved rollers of the main carriage, whose concavity has a complementary form to the circular-section girders, so they can insert themselves in a telescopic manner one inside the other.

Figs. 21, 22 and 23 show respectively a perspective view, a first side plan view and a second side plan view of the smaller carriage moving the hook for lifting the loads.

Fig. 24 shows a cross-section view of the support point of the main carriage on the girder with the larger diameter, highlighting the grooved form of the support rollers with a complementary concavity, capable

of letting the main carriage rotate for loads to be lifted in an inclined manner with respect to the vertical by the cord.

Fig. 25 shows a cross-section view of the point of support of the main carriage on the girder with the larger diameter, highlighting the grooved form of the support rollers with a complementary concavity, capable of letting the main carriage rotate for loads to be lifted in an inclined manner with respect to the vertical by the cord.

Figs. 26, 27 and 28 show an example of the possibility of the main carriage to rotate, and therefore also the smaller carriage to which the hook is secured, around an axis parallel to the main one of the telescoped girder.

Detailed exposition of one example of an implementation

[0030] Currently gantry bridge cranes are structured with a quadrangular frame supported at the top by four legs.

[0031] On the quadrangular frame, arranged centrally or directly on one of the four girders that make up the gantry, is the hoisting mechanism composed of a hook held by a cord, which is lifted and collected around a drum that is made to turn, by means of a gear unit and a motor, which can be either electric or hydraulic.

[0032] Said frame of the prior art is fixed and does not have a variable track.

[0033] Sometimes, however, for contingent requirements, some bridge gantry cranes have a frame that has a slightly variable track.

[0034] Nevertheless on the extending part of said frame it is recognised that the bridge crane cannot operate, since the hook cannot reach, accepting a loading space corresponding to the dimensions of the main girder without an extension.

[0035] The example of an implementation shown below refers to a solution that is the object of the invention, which is not limited to this, but is given only by way of example.

[0036] In particular the bridge gantry crane 1, which is the object of the invention, shown in the drawings, is structured as a frame 2 supported at the top by four legs.

[0037] A first pair of girders 14, parallel and opposite the above-mentioned frame 2, has a fixed length.

[0038] A second pair of girders 4 opposite the above-mentioned frame 2, and orthogonal to the first pair of girders 14, has the possibility of varying the track. The variation of the track for each single girder 4 connecting a pair of legs 3 is made by a first 5 and a second girder 6 that are coaxial and telescoped between themselves.

[0039] Advantageously they have a circular cross-section.

[0040] This circular section also facilitates the installation, but above all it allows the smaller carriage 8 with the cord 16 that is inclined with respect to the vertical to be used to lift loads that are not under the vertical of the girders themselves.

[0041] Preferably the length of the first outer girder 5 with respect to the second inner girder 6 is roughly equal.

[0042] This allows, in combination with a main carriage 7, whose points of support 9, 10 are at a first end 9 on the outer girder 5 and at the second end 10 on the inner girder (in particular on the exposed part of the inner girder 6 with respect to the outer girder 5) so as to be able to move, bringing one of its ends 9, 10 next to one of the outer ends of the girders 5, 6 of the frame 2.

[0043] Because said main carriage 7 can position itself according to the modes set out above, bringing itself from one end to the other of the span formed by the girders 4, both when they are in a compact state and also when they are in an extended position, this is how the track of the gantry crane 1 is always ready to be used in its entirety.

[0044] In fact, the smaller mobile carriage 8 is free to move along the guides13 of the main carriage 7 to move the load hook 11 using the relative cord 16.

[0045] It can be seen, as something very versatile, the possibility that the movement of the main carriage 7 and the small lifting carriage 8 can be implemented independently, both in a concordant manner and in a contrary manner.

[0046] The extension of the girders 4 that contribute to forming the frame 2, at least those on which the main carriage 7 slides, have a circular section.

[0047] This useful characteristic, in combination with the support rollers 12, 15 of the carriage 7 configured in a complementary manner, with a concave semi-circular section, allows the carriage 7 to move along the main axis of the girders 4, bringing the hook 11 into the desired position.

[0048] Moreover, with this advantageous section the carriage 7 can rotate around the main axis of the girder 4 of the frame 2, making it possible to load with the inclined cords 16 without causing any damage due to dragging or the like.

[0049] In fact with the load offset with respect to the vertical, during the loading phase, the carriage 7 starts to rotate and change its rotation following the raising of the load, however keeping the cords 16 always subject to a pulling action, without other components. Moreover, the connecting girder 4, which has a moment of inertia that is identical for any axis that is orthogonal to the main one, keeps the identical capacity under any load condition, both in the vertical and with the load inclined.

[0050] When the load is lowered and rested, the rotation of the main carriage 7, contrary to the previous one, automatically decreases, bringing the carriage 7 to come closer to that condition of a vertical load.

[0051] Very advantageously the track of this gantry crane 1 is variable.

[0052] This variation is achieved by a connecting girder 4 of the legs 3, composed of a first girder 5 and a second girder 6, telescoped between themselves, and preferably with the second girder 6 arranged internally and coaxially

to the first girder 5. The extension of this connection girder 4 can, therefore, reach a length of approximately double that of the two parts of the girder (first girder 5 plus the second girder 6), reaching a track that is double that of the length of the individual parts.

[0053] The main carriage 7 in this case will have a first support with its support roller 12 at one of its ends 9 on the outer girder 5 and a second support at its opposite end 10 on the inner girder 6.

[0054] To increase the versatility and the surprising characteristics of the bridge crane 1, said carriage 7, has another track, fitted with guides 13, on which a smaller carriage 8 moves that supports the loading hook 11.

[0055] In this way it is possible, with limited dimensions of the girder 5, 6 elements that form the main girder 4 of the frame 2, to have a loading hook 11 that moves along the entire wheelbase.

[0056] In fact the carriage 7 with an extension roughly the same as one of the girders 5, 6 can move freely when the telescoped girder 4 is extended to its maximum length, where the two points of support 9, 10 on rollers 12 and 15 are able to slide freely on different sections of the respective girders 5, 6, since said sliding rollers 12, 15 have a suitable section, and providing the smaller carriage 8 with a track with guides 13 roughly the same as its own length.

[0057] With these provisions, the smaller carriage 8 can reach any point of the span of the bridge crane 1, both in a reduced configuration and in an expanded configuration, exploiting both the length of the track of the carriage 7, on whose guides 13 it can move between the two support ends 9, 10, and maintaining the same supports 9, 10 on the sections with a different diameter between the main outer girder 5 and the coaxial telescopic girder 6 inside the main girder 5.

Claims

1. Gantry crane comprising an extendable frame (2) fitted with a first girder (5) connected in a moveable manner to a second girder (6) to change, based on the degree of connection, the track of said crane (6), and at least one mobile carriage (8) with a lifting hook (11), **characterised by** the fact that said mobile carriage (8) is designed to slide on a main carriage (7) fitted at one end (9) with a first connection to the first girder (5), and a second end (10) with a second connection to the second girder (6).

2. Gantry crane according to claim 1 **characterised by** the fact that said first girder (5) or at least said second girder (6) are of the box girder variety.

3. Gantry crane according to claim 1 **characterised by** the fact that said first girder (5) or at least said second girder (6) has a circular section.

4. Gantry crane according to claim 1 **characterised by** the fact that said mobile connection between said first girder (5) and said second girder (6) is telescopic in nature.

5. Gantry crane according to claim 5 **characterised by** the fact that said telescopic mobile connection is coaxial.

6. Gantry crane according to claim 3 **characterised by** the fact that said connections of the main carriage (7) on the girders (5, 6) are composed of grooved rollers (12, 15) with a concave shape that is complementary to said girders (5, 6).

7. Gantry crane according to claim 3 **characterised by** the fact that said main carriage (7) turns around a rotation axis parallel to the main one of the girders (5, 6) on which it rests.

8. Gantry crane according to one or more of the previous claims **characterised by** the fact that the carriage (8) to which the hook (11) for lifting loads is connected, and/or for moving it on the guide tracks (13) of the main carriage (7) and/or for moving the main carriage (7) on the telescoped girder (4), reaches any position inside any track of the gantry crane (1).

Fig. 1

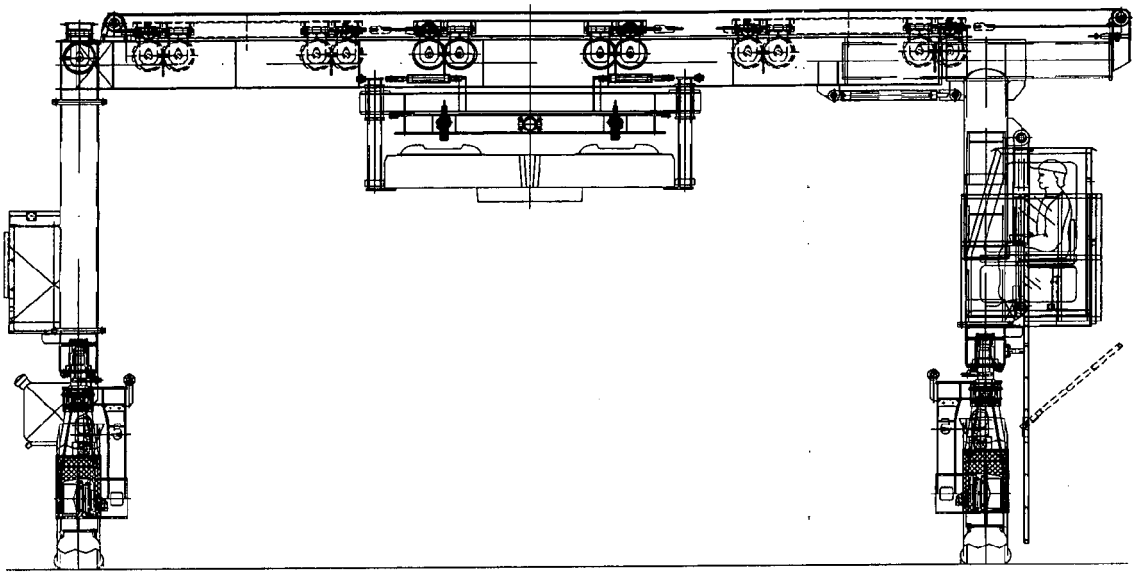


Fig. 2

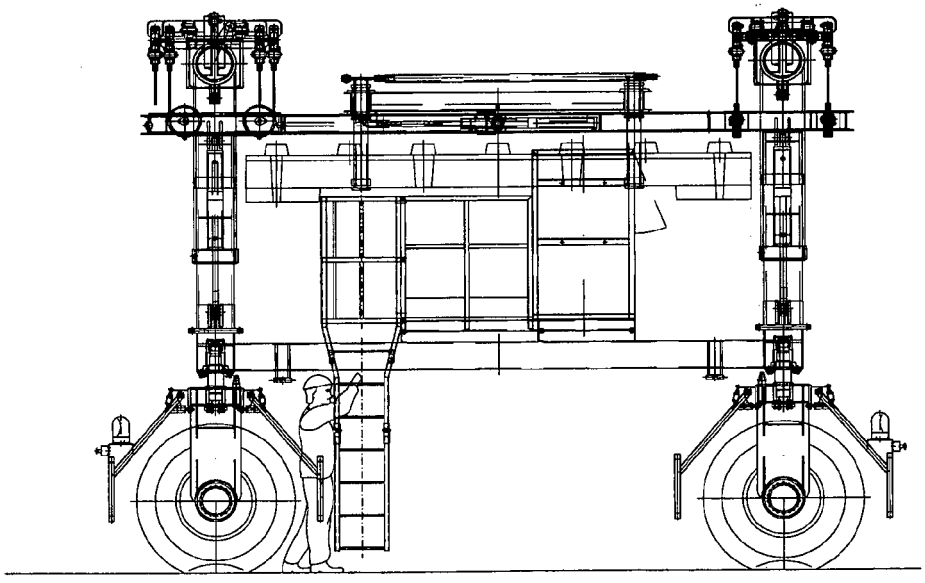
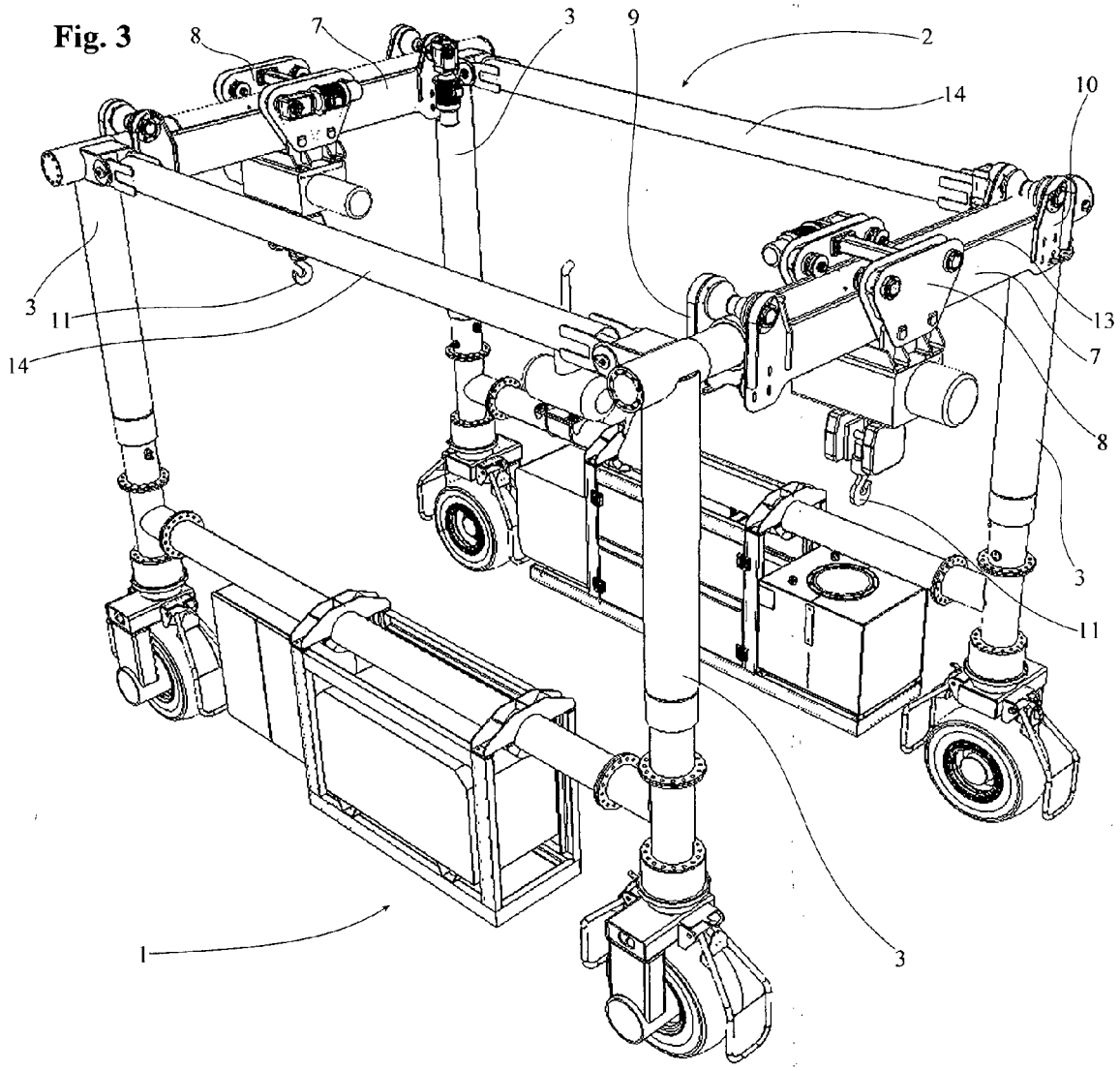


Fig. 3



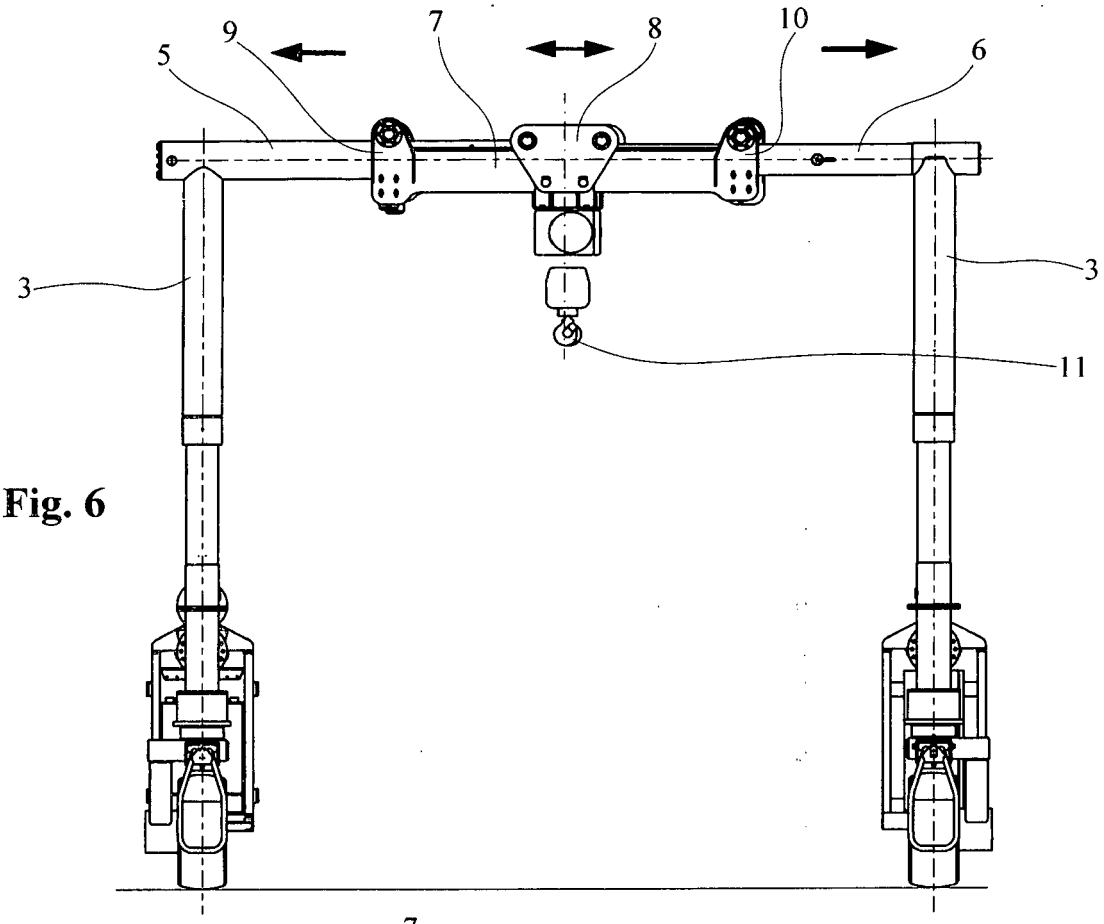


Fig. 6

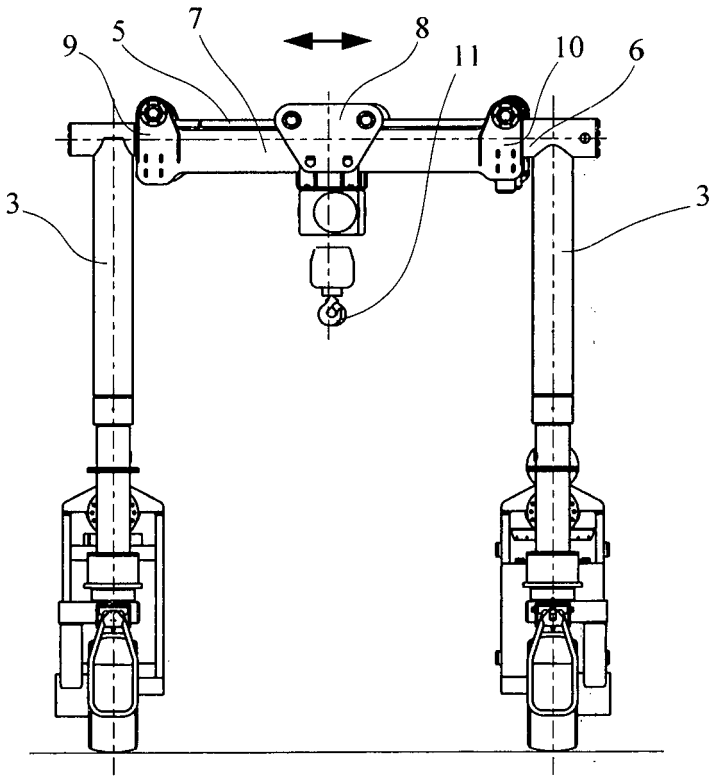


Fig. 4

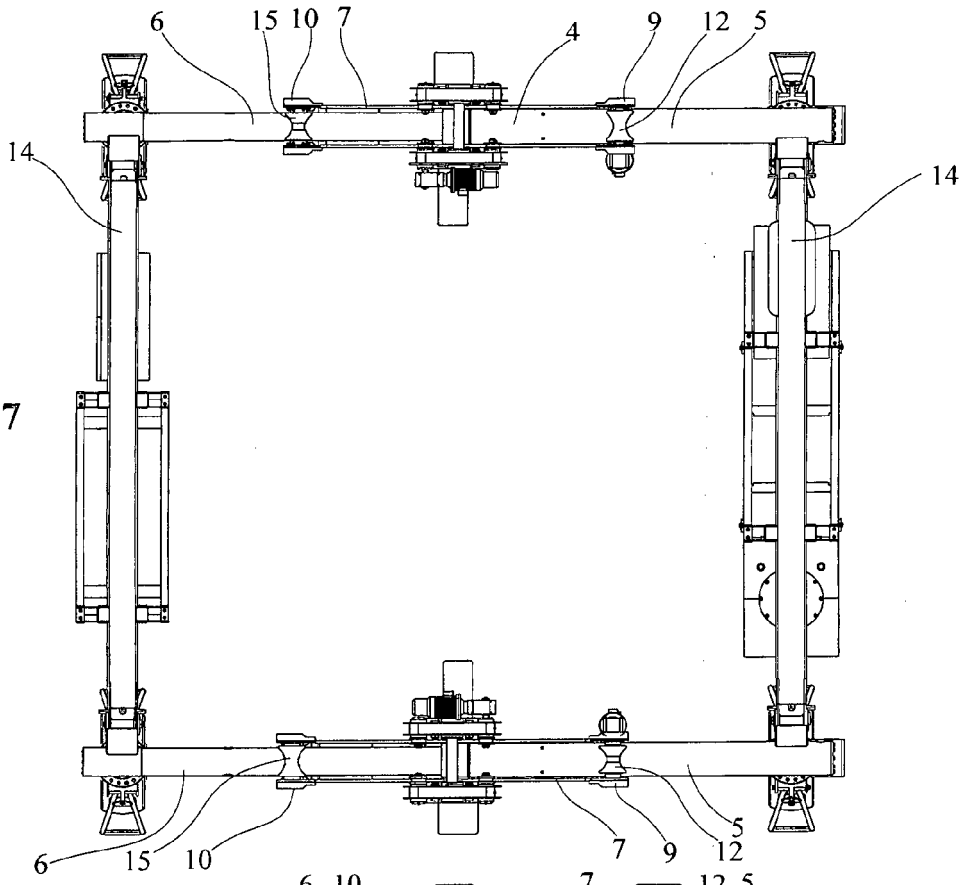

6
15
10
7
4
9
12
5
14
14
6
15
10
7
9
12
5

Fig. 7

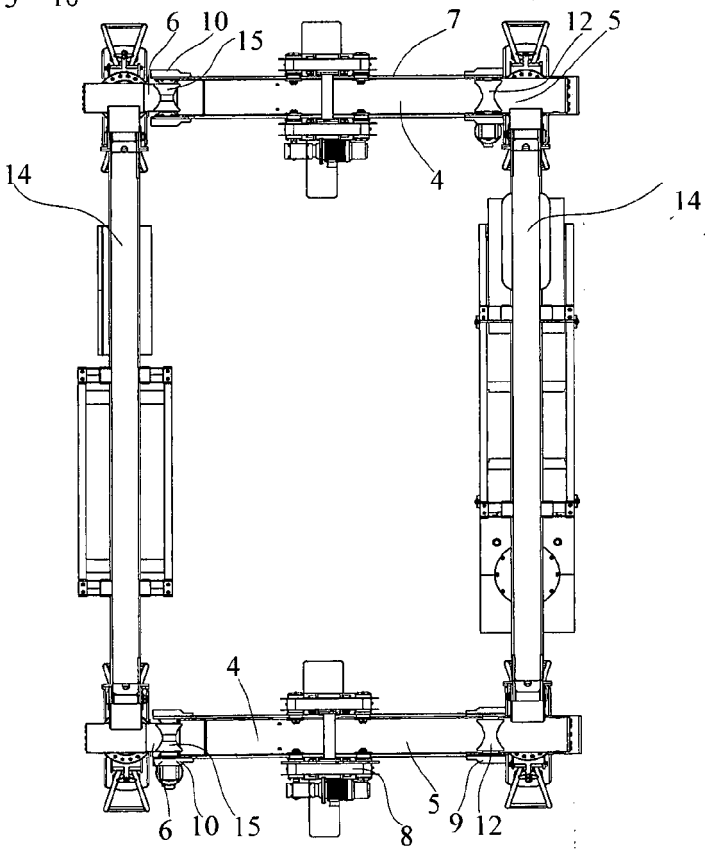

6
10
15
7
12
5
14
4
14
4
6
10
15
8
5
9
12

Fig.5

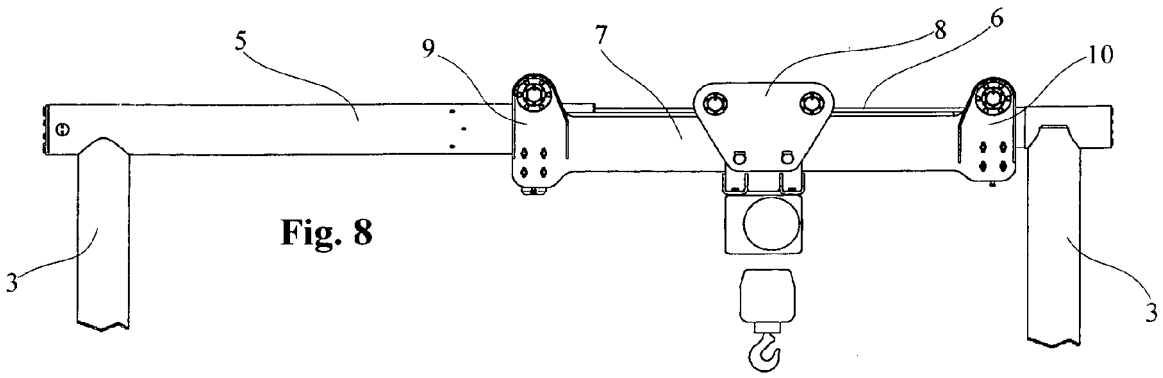


Fig. 8

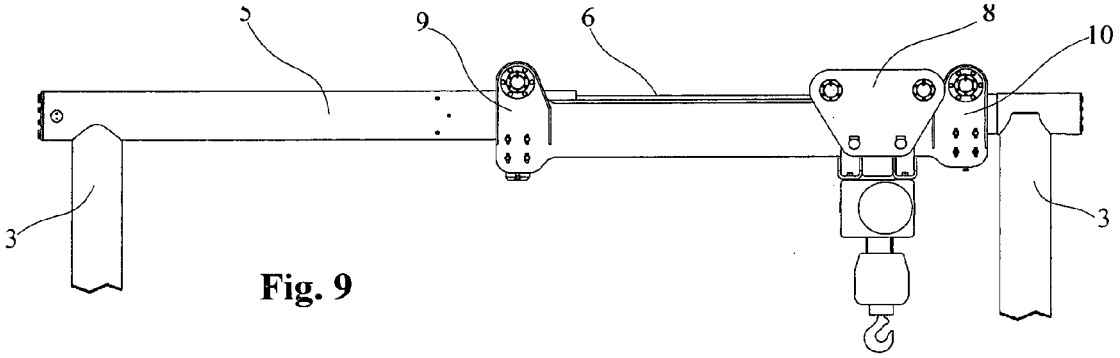


Fig. 9

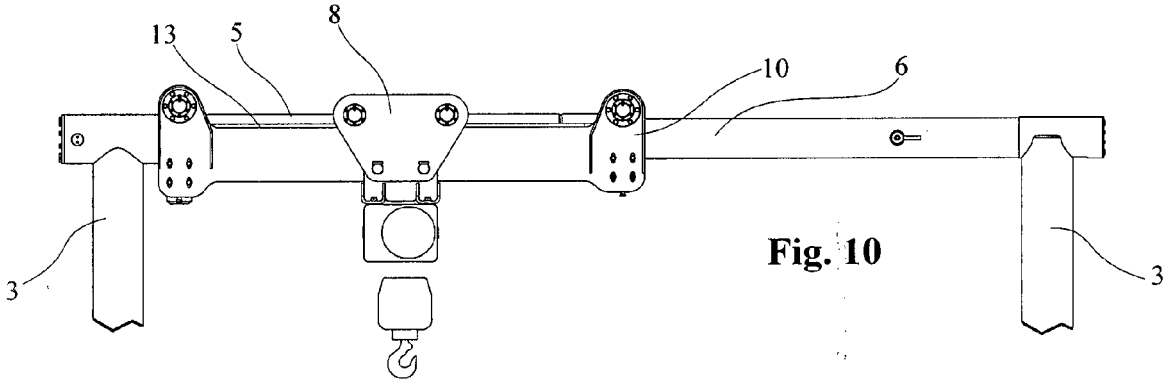


Fig. 10

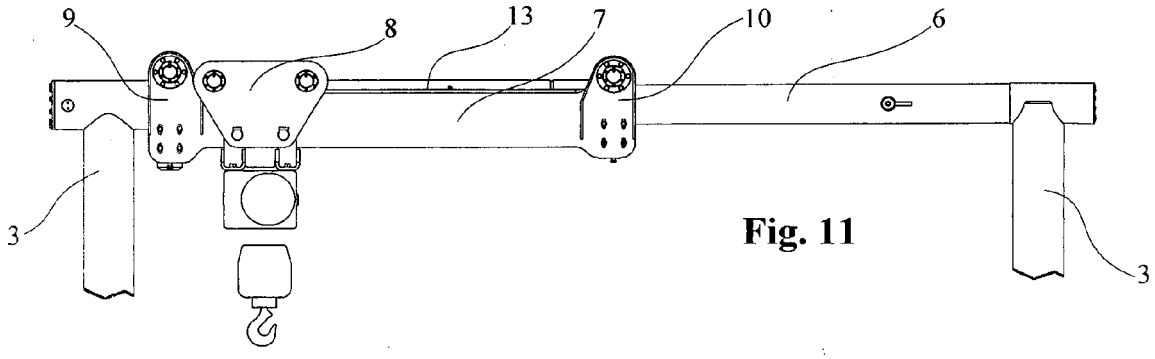


Fig. 11

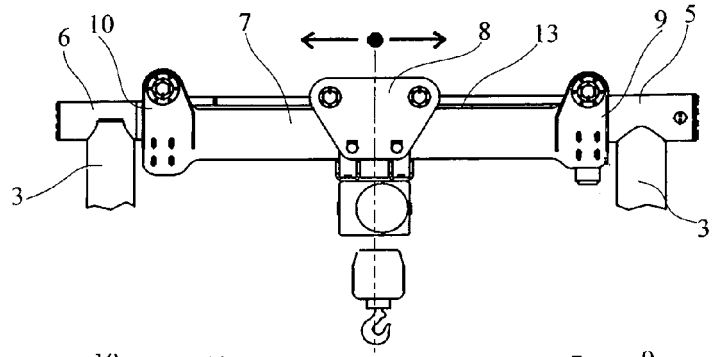


Fig. 12

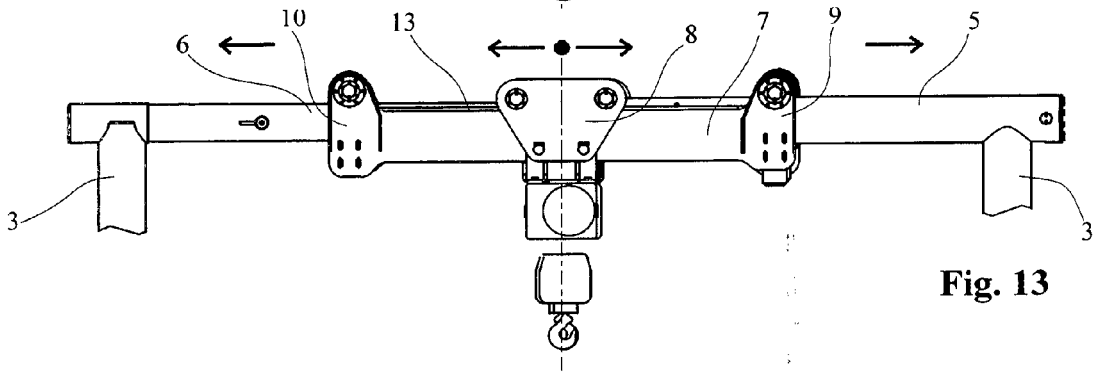


Fig. 13

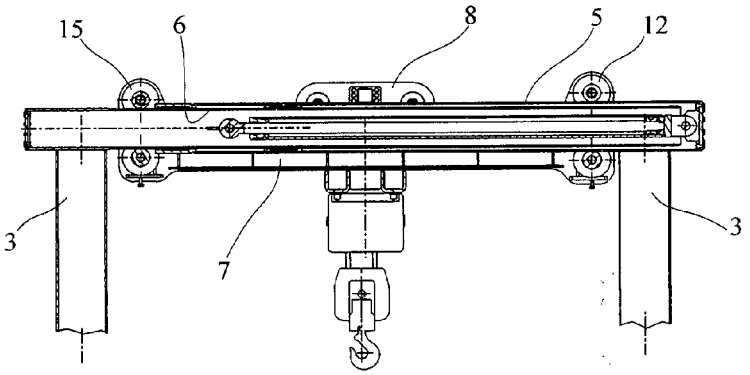


Fig. 14

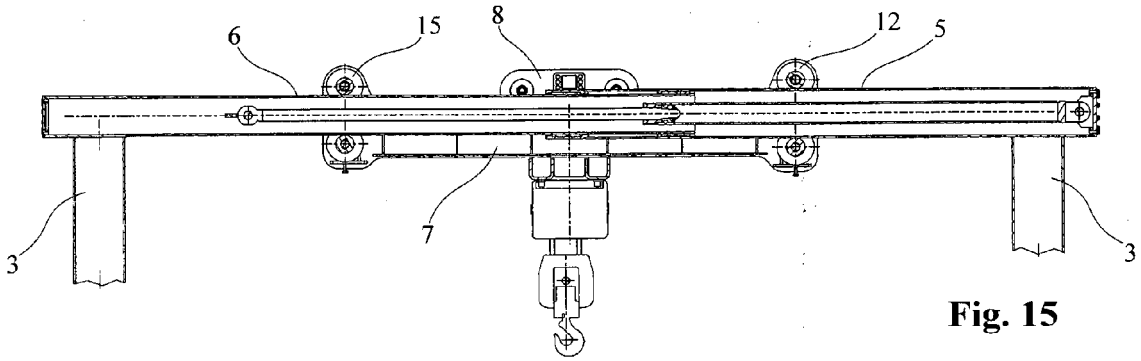


Fig. 15

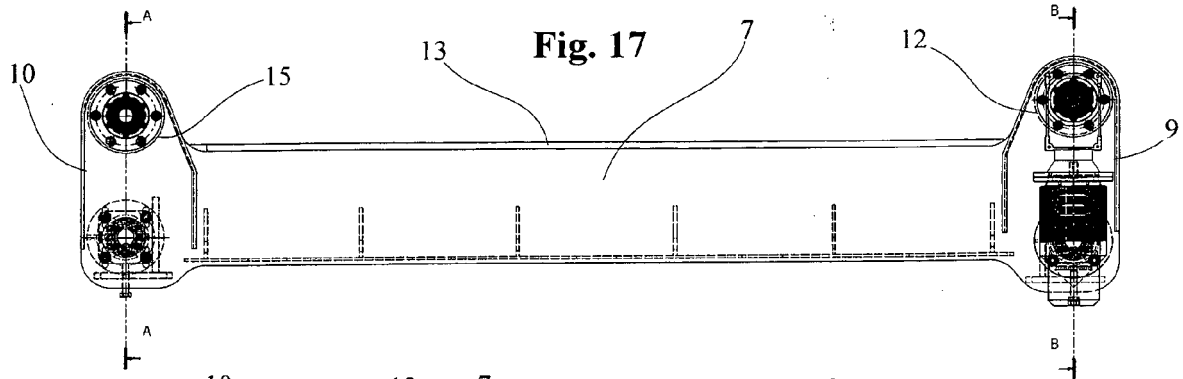


Fig. 17

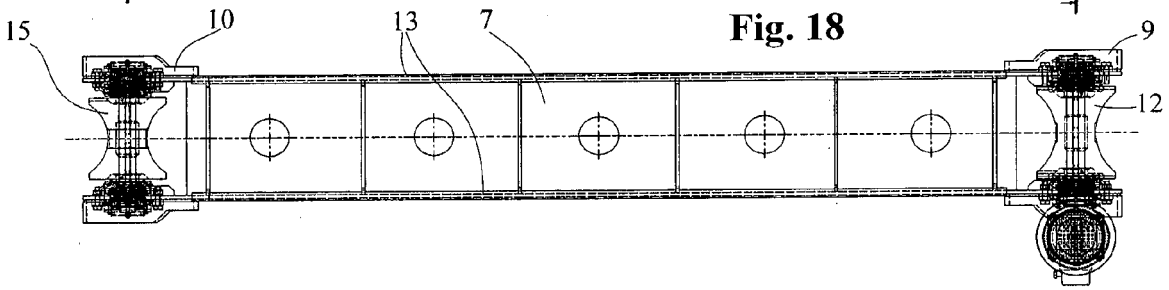


Fig. 18

Fig. 19

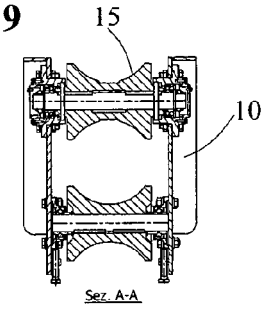
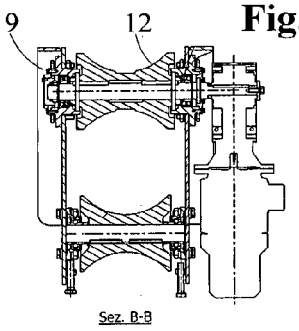


Fig. 20



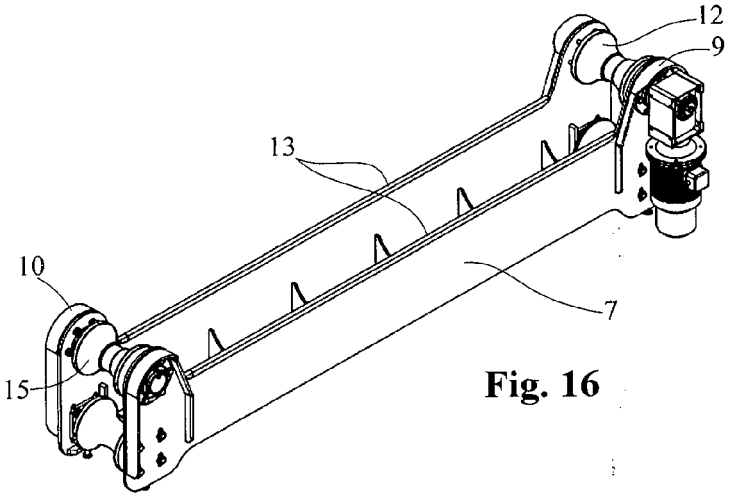


Fig. 16

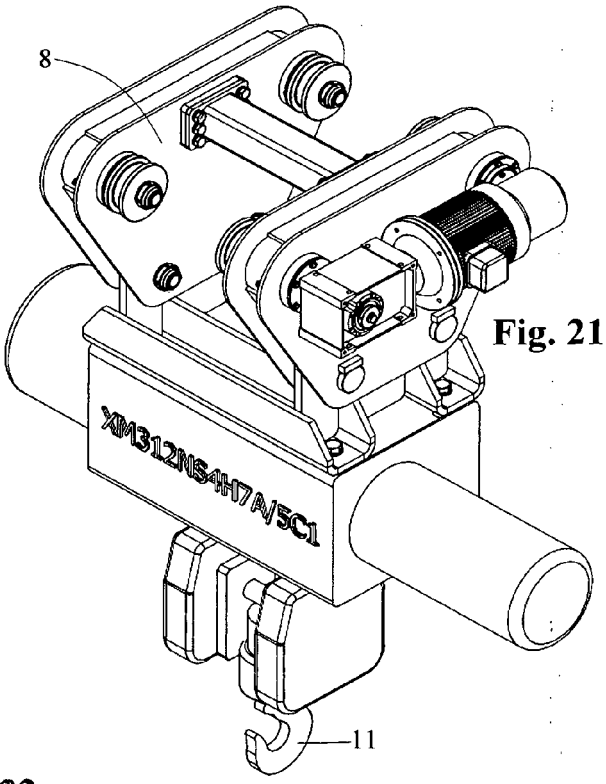


Fig. 21

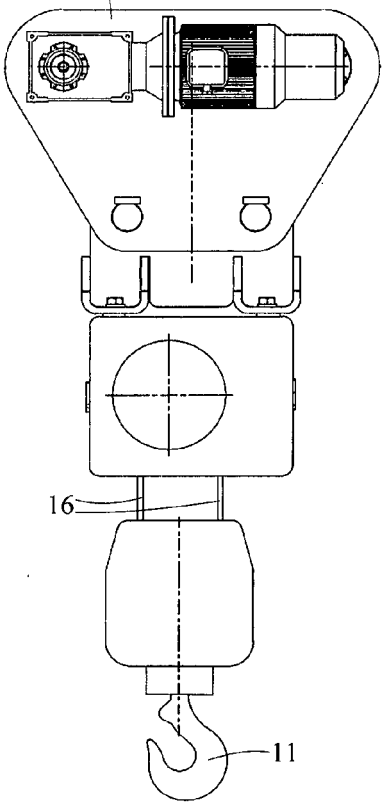


Fig. 22

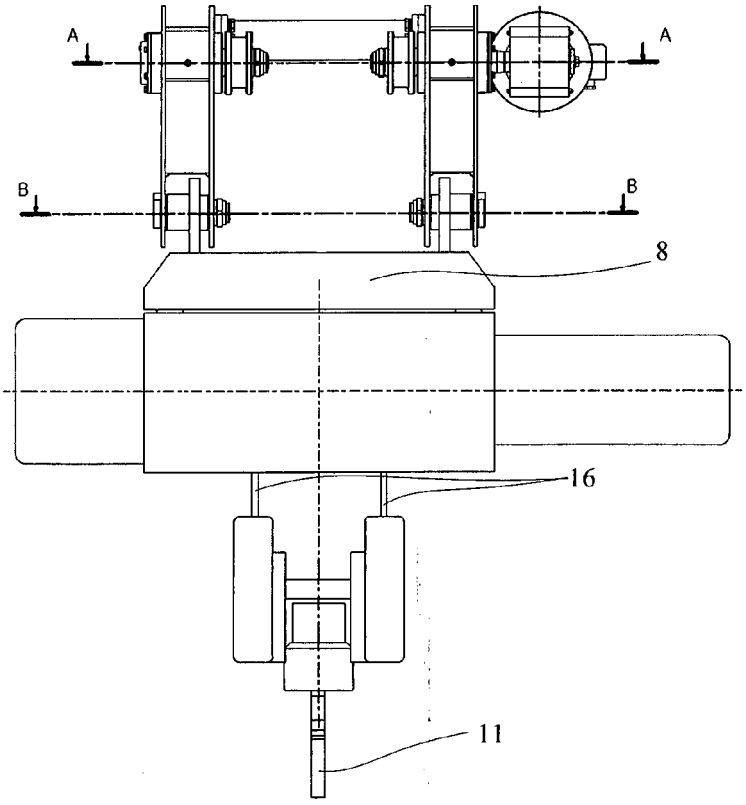


Fig. 23

Fig. 24

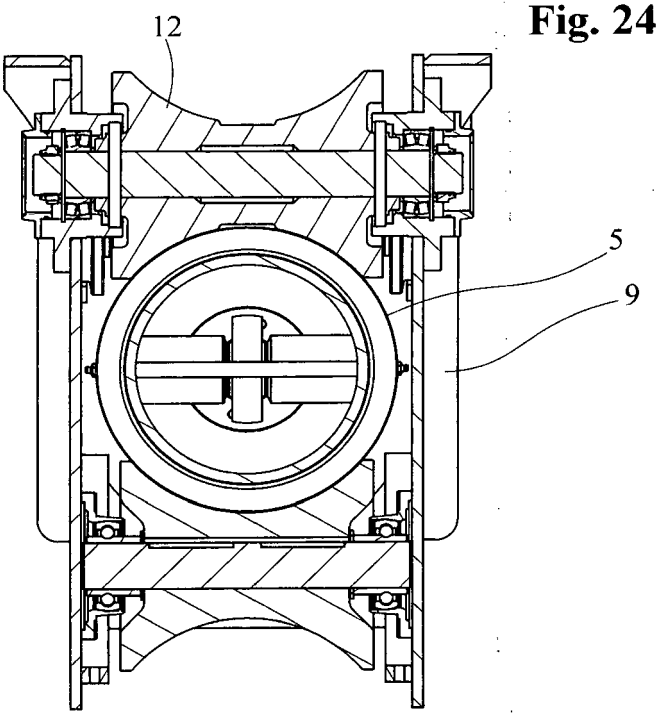
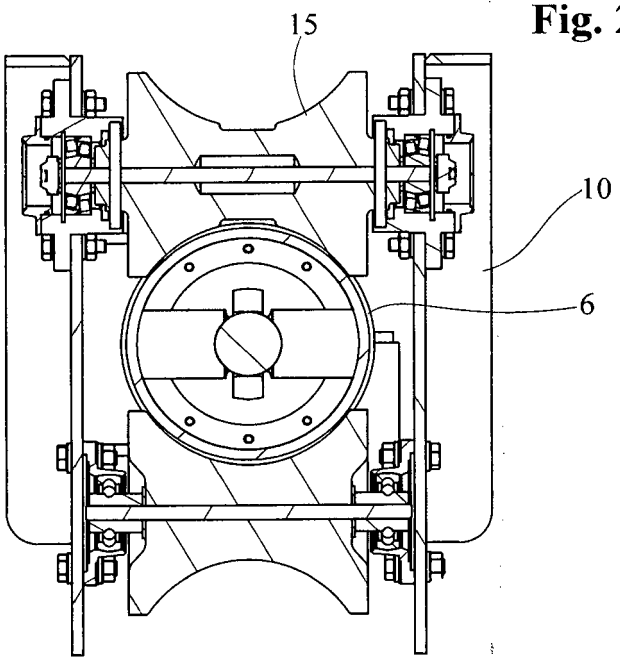


Fig. 25



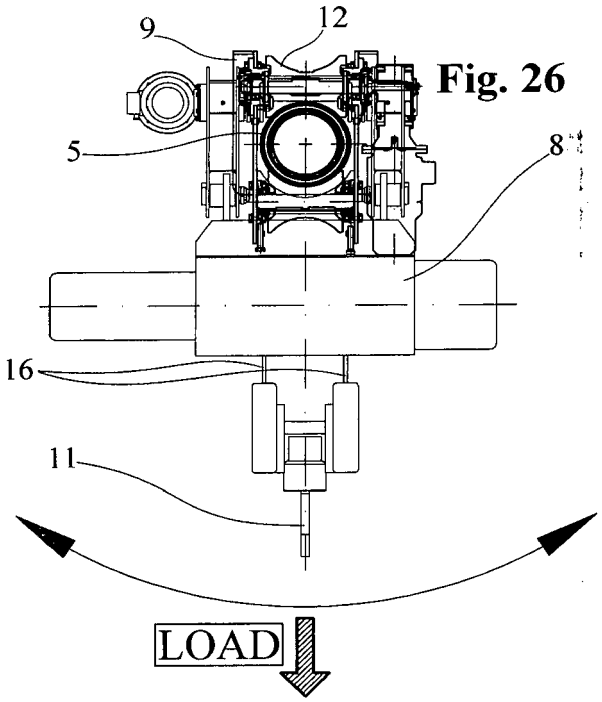


Fig. 26

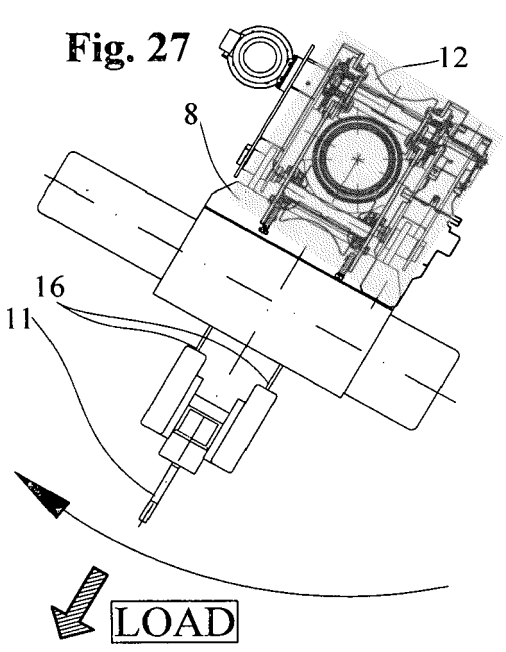


Fig. 27

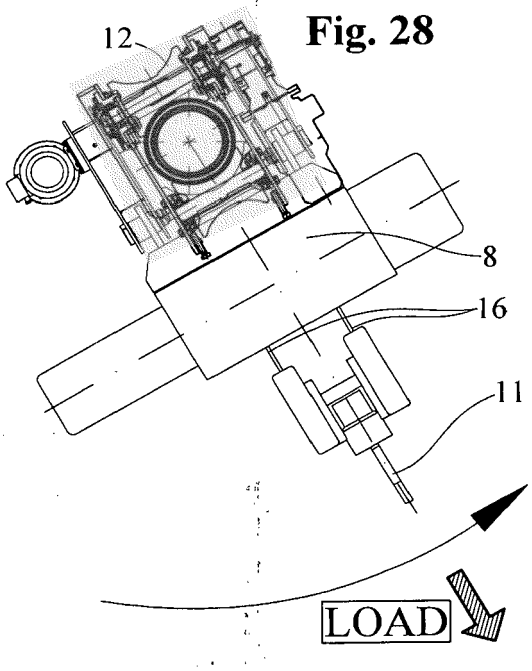


Fig. 28

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 00 0615

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	GB 1 212 425 A (HIMSWORTH GORDON REGINALD [FR]) 18 November 1970 (1970-11-18)	1-3,6-8	INV.
A	* figures *	4,5	B66C19/00
	* detailed decription; see page 2 *		B66C19/02

X	FR 1 427 076 A (FRANCE NEIGE) 4 February 1966 (1966-02-04)	1	
Y	* all the figures, especially figure 1 *	4,5	

X	EP 2 479 132 A2 (THEUERER HERBERT [DE]) 25 July 2012 (2012-07-25)	1	
Y	* abstract; figures *	4,5	

A	WO 03/068650 A2 (MORREIM STEVEN [US]) 21 August 2003 (2003-08-21)	1	
	* abstract; figures *		

TECHNICAL FIELDS SEARCHED (IPC)
B66C
B60P
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 April 2015	Guthmuller, Jacques

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 00 0615

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-04-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1212425 A	18-11-1970	FR 1522854 A	26-04-1968
		GB 1212425 A	18-11-1970
FR 1427076 A	04-02-1966	CH 428137 A	15-01-1967
		FR 1427076 A	04-02-1966
EP 2479132 A2	25-07-2012	NONE	
WO 03068650 A2	21-08-2003	AU 2003216293 A1	04-09-2003
		US 2003180132 A1	25-09-2003
		WO 03068650 A2	21-08-2003

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82