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

(11) **EP 2 540 654 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.01.2013 Bulletin 2013/01

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

(21) Application number: **11172150.2**

(22) Date of filing: **30.06.2011**

(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

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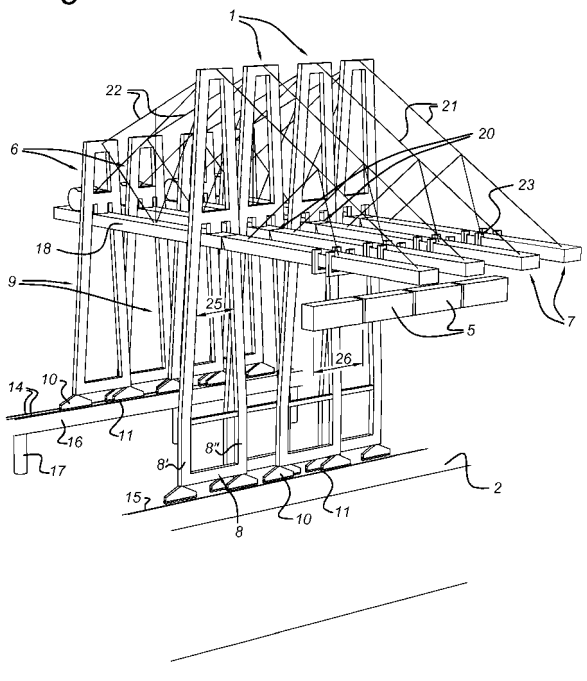
(54) **Ship to shore crane installation with offset cranes**

(57) A ship to shore crane installation comprises a quay (2) defining a longitudinal and a transverse direction, and at least two ship to shore cranes (1) which are displaceable along said quay according to said longitudinal direction. The ship to shore cranes have a gantry structure (6) and a girder (7) supported by the gantry structure. The girder (7) of each ship to shore crane (1) is arranged according to said transverse direction. A trolley (8) is moveable along the girder (7) for transferring a container (5). The gantry structures (6) of directly adjacent ship to shore cranes (1) are offset with respect to each other in the transverse direction so as to enable simultaneous access to directly adjacent container bays of a container ship.

Fig. 1



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Description

[0001] The invention is related to a ship to shore crane installation, comprising a quay defining a longitudinal and a transverse direction, and at least two ship to shore cranes which are displaceable along the quay according to said longitudinal direction, wherein each ship to shore crane has a gantry structure and a boom supported by the gantry structure, the boom of each ship to shore crane being arranged according to said transverse direction, and a trolley supported by the boom for transferring a container.

[0002] Such crane installation is generally known in the field of container handling. Container transport of goods has become widespread in all kinds of industry and trade. Consequently, there is a steady growth in the use of container ships. Furthermore, there is a trend towards larger sized container ships, transporting several thousands of containers at a time. Very large container ships may even carry the equivalent of 8.000 to 15.000 TEU's (twenty foot equivalent units) at a time. The costs associated with such ships has increased accordingly. In this connection, the time span during which such ships are moored in a harbour is of high importance. These cost are both associated with the downtime of the ship, as well as with the harbour fees involved. It has therefore become of the utmost importance to increase the efficiency of the container transfer between ship and shore, so as to limit the period of stay in a harbour.

[0003] With the aim of minimizing the time required for loading and unloading a container ship therefore, several cranes are applied at the same time for transferring containers between the quay and the ship. A container ship comprises numerous adjacent container bays which extend in the transverse direction of the container ship. Within each bay, containers are stacked next to and upon each other in the longitudinal direction of the ship. The ship to shore cranes are displaced along the quay up to a position for accessing these bays and the containers accommodated therein. The cantilever part of the boom extends above the full container bay, in such a way that all containers therein can be handled.

[0004] As a result of the particular construction of the ship to shore cranes, these cannot be moved so close to each other that directly adjacent become accessible in a simultaneous fashion. Each crane requires sufficient spacing between its legs to allow a 45 feet container to pass between said legs. Thus, the distance between individual legs of a crane is larger than the length of a single container, making it impossible for adjacent cranes to access directly adjacent bays. The ship to shore cranes are too wide, which means that always an inaccessible intermediate bay is left over between the two bays which are handled simultaneously. This has however disadvantages as to the efficiency of the handling process. In case it is desirable to access the intermediate bay, both cranes which border the intermediate bay are to be moved.

[0005] The object of the invention is therefore to provide a ship to shore crane installation which allows a more flexible handling of the containers in adjacent container bays. This object is achieved by an installation according to which the gantry structures of directly adjacent ship to shore cranes are offset with respect to each other in the transverse direction.

[0006] In the installation according to the invention, the ship to shore cranes can be moved closer to each other due to the fact that they are not exactly aligned, but displaced somewhat with respect to each other in the direction of the booms thereof. This adapted position of the ship to shore cranes with respect to each other offers the possibility to access two directly adjacent bays of a containership simultaneously by respective cranes. In this connection, the cranes are arranged alternately in a position somewhat closer to the edge of the quay and a position at a somewhat greater distance from the quay. The difference in position is however limited, because only the widest parts, in particular the legs of the gantry structure, should be able to pass each other in longitudinal direction. The reach of the boom belonging to the crane which is positioned somewhat further away from the edge of the quay should be enough to attain the most remote containers in the bays of the container ship.

[0007] Furthermore, the water side frame of one ship to shore crane is located between the water side frame and the land side frame of the directly adjacent ship to shore crane, seen in the transverse direction. The water side and the land side of the respective booms of the at least two ship to shore cranes are arranged according to the same orientation. Also, the ship to shore cranes are generally identical.

[0008] The quay may be provided with at least two tracks extending generally in the longitudinal direction, said tracks being offset with respect to each other. In this case, the ship to shore cranes are each provided with support wheels, in such a way that the support wheels of one ship to shore crane are supported by one of said tracks and the support wheels of a directly adjacent ship to shore crane are supported on an other track.

[0009] The tracks in question are next to each other in the transverse direction, wherein one of the tracks is situated somewhat closer to the edge of the quay than the other track. Preferably, each track may comprise a pair of rails supported with respect to the quay. The water side rail of each pair is accommodated on or in the surface of the quay. Furthermore, the land side rail of each pair is accommodated on or in an elevated rail beam. It is however also possible to position both rails directly on the quay surface. Alternatively, both rail may be positioned at an elevated level; it is also possible that the water side track is at an elevated level and the land side track is positioned on the quay surface.

[0010] In a known way, the boom may have a fixed boom section connected to the gantry structure, and a hinged boom section connected to the fixed boom section through a hinge construction. Furthermore, the gantry of each ship to shore crane may have a water side frame

and a land side support frame, the support frames of directly adjacent cranes being offset with respect to each other. Each support frame has two legs between which the boom extends.

[0011] In this connection, it may occur that the mutual distance of the legs of the water side frame is smaller than the length of a large container. In order to make it possible for such container to pass the water side frame, the trolley may be provided with slewing means for rotating the container with respect to a vertical axis. This provides a ship to shore crane with a minimum width, which is useful to position the ship to shore cranes as close as possible. It should be noted that the mutual distance of the legs may be large enough to let pass a so-called 20 ft. containers. However, in the case of handling 40 ft. containers, the slewing action is necessary to make these pass the frame.

[0012] The invention will now be described further with reference to an embodiment shown in the drawings.

Figure 1 shows a view in perspective of the installation according to the invention.
Figure 2 shows a side view of the installation.
Figure 3 shows a top view of the installation.

[0013] The ship to shore crane installation as shown in figure 1 comprises several ship to shore cranes 1 which are accommodated on the quay 2. The quay 2 borders a harbour with a container ship 3 as shown in figures 2 and 3. The hold of the container ship 3 has a plurality of container bays 4 which extend transverse with respect to the longitudinal direction of the ship 3. Within and above these container bays 4, the containers 5 are stacked upon and next to each other.

[0014] The ship to shore cranes 1 each have a gantry structure 6 supporting a boom structure 7. A trolley 23 travels back and forth along the boom structure for transferring the containers 5 between the ship 3 and the quay 2. Each gantry 6 has a water side frame 8 and a land side frame 9, the lower ends of which are supported by means of crane travel mechanisms 10 with a plurality of wheels 11. Furthermore, the quay 2 has a water side track 12 and a shore end track 13 for guiding the wheels 11 of the crane travel mechanisms 10. The water side track 12 and the shore end track 13 largely overlap each other in transverse direction, however the overall position of the shore end track is closer to the edge of the quay than the other track 13.

[0015] In the embodiment shown, each track 12, 13 consists of two parallel rails 14,15. The rail 14 which are located at the land side of each track 12, 13 are at higher level than the quay mounted rails 15. In particular, the land side rails 14 are accommodated on an elevated beam 16, supported by columns 17. Over the tracks 12, 13, the ship to shore cranes 1 may be displaced in longitudinal direction of the quay 2 so as to be positioned in the desired location with respect to the container bays 4.

[0016] As a result of the offset position of the tracks 12, 13, the water side frames 8 of the ship to shore cranes 1 may be displaced somewhat along each other in the longitudinal direction, causing an overlap thereof as is visible in figures 1 and 3. Also the land side frames 9 may overlap each other in this way. Thus, the boom structures 7 of directly adjacent ship to shore cranes may be positioned at the same pitch distance as the pitch distance between two directly adjacent container bays of the ship 3.

[0017] As is known, the boom structure 7 has a fixed boom section fixedly connected to the gantry structure 6, and a hinged boom section 19 connected to the fixed boom section through a hinge construction 20. The hinged boom section 19 is displaceable between an operative position as shown in full lines, and an upwardly swung position indicated by dotted lines through pull member. Furthermore a tension member 22 has been provided for stabilizing the hinged boom section.

[0018] The trolley is provided with a slewing ring 24 by means of which the container 5 can be rotated from the longitudinal direction as shown in the figures, into a transverse direction. This may be necessary for making the container 5 pass the legs 8', 8" of the water side frame 8. In the case of a narrow spacing 25 of the legs 8', 8", the dimension thereof may be smaller than the length 26 of a container. By rotating the container into the transverse orientation, such large container may safely pass the water side frame 8.

List of reference numerals

[0019]

1.	Ship to shore crane
2.	Quay
3.	Container ship
4.	Container bay
5.	Container
6.	Gantry structure
7.	Boom structure
8.	Water side frame of gantry structure
8', 8"	Legs of water side frame
9.	Land side frame of gantry structure
10.	Crane travel mechanism
11.	Wheel of crane travel mechanism
12.	Water side track

13. Land side track
14. Land side rails of tracks
15. Water side rails of tracks
16. Beam
17. Column
18. Bridge girder
19. Boom girder
20. Hinge construction
21. Pull member
22. Tension member
23. Trolley
24. Slewing ring
25. Spacing of legs
26. Length of container

Claims

1. Ship to shore crane installation, comprising a quay (2) defining a longitudinal and a transverse direction, and at least two ship to shore cranes (1) which are displaceable along said quay according to said longitudinal direction, wherein each ship to shore crane has a gantry structure (6) and a crane girder (7) supported by the gantry structure, the crane girder (7) of each ship to shore crane (1) being arranged according to said transverse direction, and a trolley (8) supported by the crane girder (7) for transferring a container (5), **characterised in that** the gantry structures (6) of directly adjacent ship to shore cranes (1) are offset with respect to each other in the transverse direction.

2. Installation according to claim 1, wherein parts (8, 8', 8") of the gantry structures (6) of directly adjacent ship to shore cranes (1) overlap each other in the longitudinal direction.

3. Installation according to any of the preceding claims, wherein the gantry structure (6) of each ship to shore crane (1) has a water side frame (8) and a land side frame (9), the support frames (8, 9) of directly adjacent cranes (1) being offset with respect to each other.

4. Installation according to claim 3, wherein each support frame (8, 9) has two legs between which the crane girder (7) extends.

5. Installation according to claim 4, wherein the mutual distance (25) of the legs (8', 8") of the water side frame (8) is smaller than the length (26) of a container (5), the trolley (23) being provided with slewing means (24) for rotating a container (5) with respect to a vertical axis.

6. Installation according to any of claims 3-5, wherein the water side frame (8) of one ship to shore crane (1) is located between the water side frame (8) and the land side frame (9) of the directly adjacent ship to shore crane (1), seen in the transverse direction.

7. Installation according to any of the preceding claims, wherein the quay (2) is provided with at least two tracks (12, 13) extending generally in the longitudinal direction, said tracks being offset with respect to each other, and the ship to shore cranes (1) are each provided with support wheels (11), in such a way that the support wheels of one ship to shore crane are supported by one of said tracks and the support wheels of a directly adjacent ship to shore crane are supported on an other track.

8. Installation according to claim 7, wherein each track (12, 13) comprises a pair of rails (14, 15) supported with respect to the quay (2).

9. Installation according to claim 8, wherein the water side rail (15) of each pair (12, 13) of rails is accommodated on or in the surface of the quay (2).

10. Installation according to claim 8 or 9, wherein the land side rail (14) of each pair (12, 13) of rails is accommodated on or in an elevated rail beam (16).

11. Installation according to any of claims 7-10, wherein the wheels (11) of each ship to shore crane (1) are arranged according to sets which are accommodated in crane travel mechanisms (10).

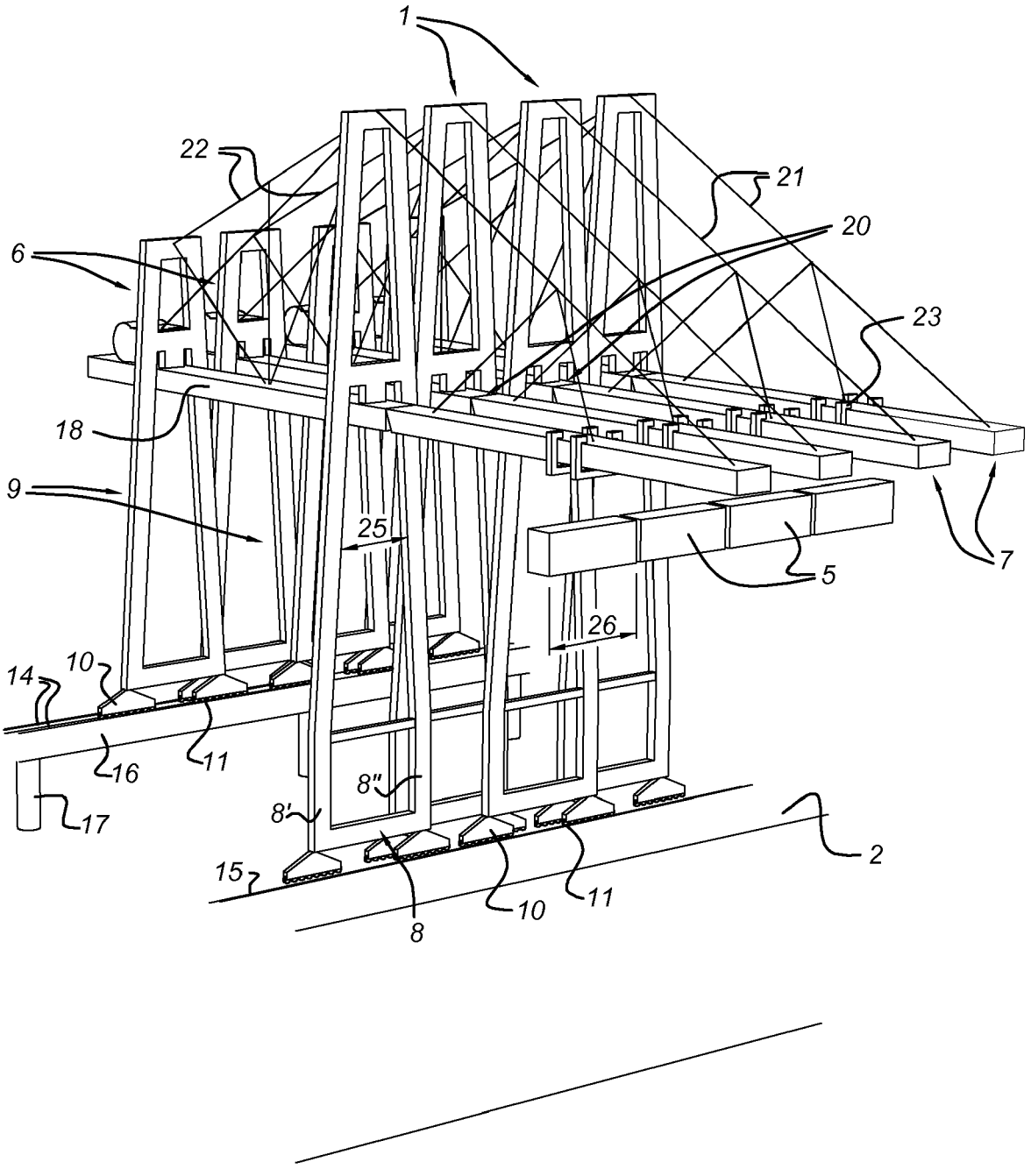
12. Installation according to any of the preceding claims, wherein the crane girder (7) has a fixed bridge girder (18) connected to the gantry structure (6), and a hinged boom girder (19) connected to the fixed boom girder through a hinge construction (20).

13. Installation according to any of the preceding claims, wherein the gantry structure (6) of each ship to shore crane (1) has a water side frame (8) and a land side frame (9), the support frames (8, 9) of directly adjacent cranes (1) being offset with respect to each other.

14. Installation according to claim 13, wherein each support frame (8, 9) has two legs between which the crane girder (7) extends.

15. Installation according to claim 14, wherein the mutual distance (25) of the legs (8', 8") of the water side frame (8) is smaller than the length (26) of a container (5), the trolley (23) being provided with slewing means (24) for rotating a container (5) with respect to a vertical axis.

Fig. 1



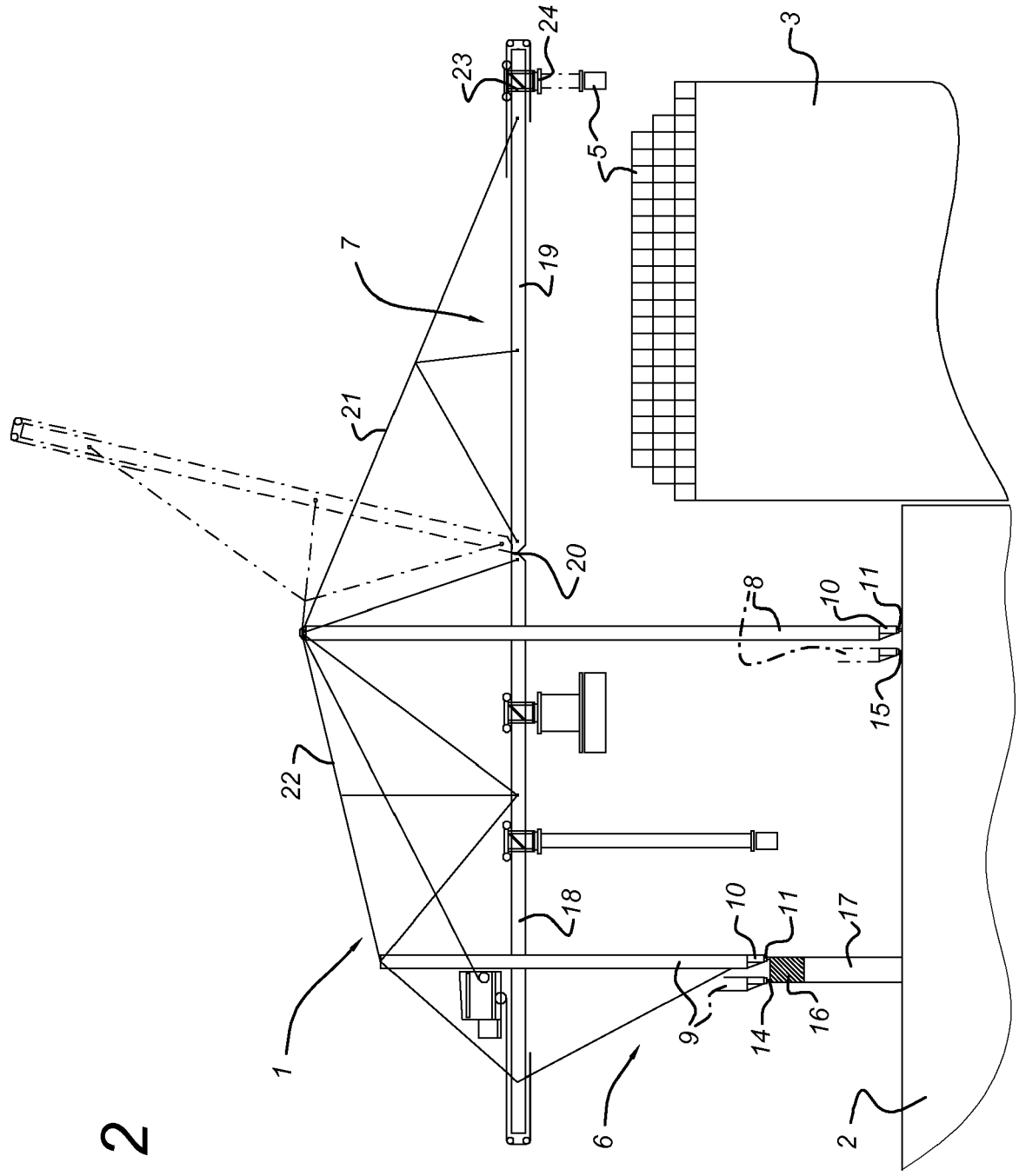
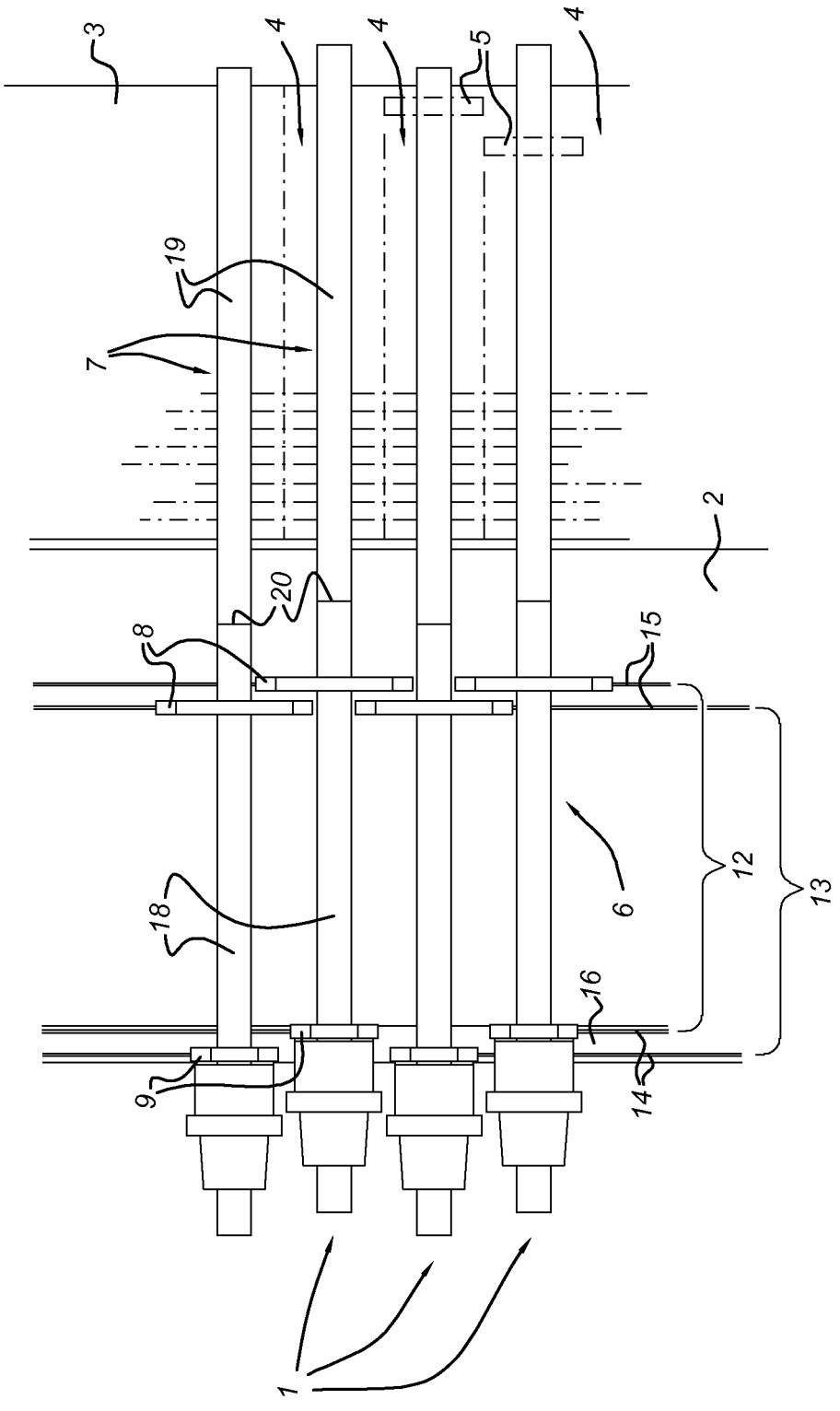


Fig. 2

Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 2150

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			B66C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 November 2011	Fiorani, Giuseppe

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 17 2150

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