



(11) Publication number : **0 558 155 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **93200556.4**

(51) Int. Cl.⁵ : **B66C 19/00**

(22) Date of filing : **26.02.93**

(30) Priority : **28.02.92 NL 9200376**

(43) Date of publication of application :
01.09.93 Bulletin 93/35

(84) Designated Contracting States :
BE DE ES FR NL

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(54) **Gantry crane.**

(57) A gantry crane for loading/unloading cargo, packets or break-bulk such as paper rolls, coils, drums, bundled timber and the like from ships, which crane comprises a portal (1), a girder (2) supported by the portal and having a first horizontal transport path (3), a trolley (4) provided with hoisting winches movable along this transport path, wherein the portal (1) is provided with a transfer station (10) at a lower level than the girder (2), wherein at least a second horizontal, and if necessary a vertical (14), conveyor is arranged in the portal which extends between the transfer station (10) and a delivery, receiving station at the level of the quay (K).

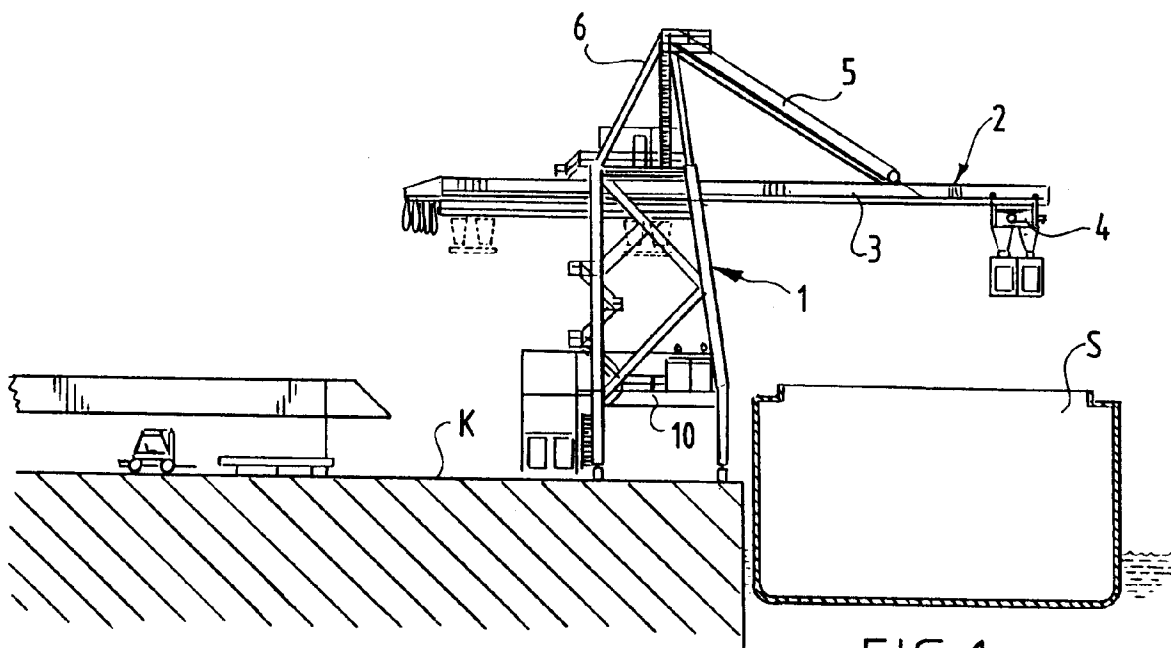


FIG.1

The invention relates to a gantry crane for loading/unloading cargo, packets or break-bulk such as paper rolls, coils, drums, bundled timber and the like from ships, which crane comprises a portal, a girder supported by the portal and having a first horizontal transport path, a trolley provided with hoisting winches movable along this transport path.

With cranes of the type described in the preamble it is usual to use the hoisting cables of the trolley to hoist for example cargo, packets, other than containers, out of the hold of a ship and to then transport them in horizontal sense above the quay and finally set the load down on the quay or on transport means, such as goods vehicles and the like, situated on the quay. To load the ship the load movement takes place in reverse sequence. With such a manner of loading and unloading the problem arises that the transporting times of the trolley with load suspended therefrom are relatively long, so that the crane cannot be used optimally.

The invention has for its object to obviate the above-stated drawback and provides for this purpose a gantry crane which is distinguished in that the portal is provided with a transfer station at a lower level than the girder, wherein at least a second horizontal conveyor is arranged in the portal, which extends between the transfer station and a delivery, receiving station at the level of the quay.

Due to the transfer station in the portal it is possible to be able to perform the total logistics of transport "through the gantry crane" in optimal manner, in that the path of the load hanging on the trolley is limited to a minimum. The reciprocal movement time of the trolley is therefore shortened and this makes the unloading times shorter. In the second transport path a cargo buffer can be created in order to adapt the cycle times of the further transport to the cycle time of the trolley movement. Practical tests have established that the loading/unloading time with a crane according to the invention can be quadrupled relative to a conventional bridge crane.

The second transport path preferably has a horizontal transport section with a vertical transport section connecting thereto. It can be advantageous herein to split the horizontal as well as the vertical portion of the transport path into two or more paths.

Above mentioned and other features will be elucidated further in the figure description hereinbelow of an embodiment. In the drawing:

Fig. 1 shows a standing side view of the gantry crane according to the invention with a ship lying alongside the quay and land transport means shown on the quay,

fig. 2 shows a perspective top view of the gantry crane of fig. 1,

fig. 3 shows a perspective top view of a part of the conveyor situated in the portal,

fig. 4 shows a hoisting system suitable for a trol-

ley in the crane of fig. 1 for transporting a load to be fixed to a hoisting yoke.

Designated in the drawings with the numeral 1 is the portal of the gantry crane according to the invention, which portal can be constructed from a framework of columns and beams with stiffening shores. Arranged in the top of the portal 1 is a girder 2 which is provided with a transport path 3 for the reciprocal movement of a trolley 4 which in the embodiment shown can be moved from a position indicated with the full line on the right in fig. 1 to a position indicated with the dashed line of the girder 2 and vice-versa.

The portion of the girder 2 situated above the loading/-unloading location for the ocean-going vessel can be swung back according to the known art by a pivot construction arranged in the girder and by means of a tackle 5 which extends between a point of the movable part of girder 2 to a tower construction 6 on top of portal 1. The swung-back position of the girder 2 is shown in fig. 2 and designated 2'.

According to the invention the portal is provided with a transfer station, wherein the load is delivered by the trolley and subsequently transferred to a second conveyor situated in the portal 1. The transfer station is designated in figure 1 with the numeral 10 and is situated at a determined height above the quay K such that free transport of land vehicles through the portal remains possible. The transfer station and the second conveyor are indicated schematically in fig. 3.

The transfer station consists of an unloading bay 11 onto which the load L can be set down and where the box or cage 12 containing the load on either side can be taken away. The box or cage 12 is adapted to the load. This cage forms part of the transport system in the crane. The cage 12 is suspended from the trolley via a yoke 20, which will be further elucidated below. Such a cage 12 enables handling of so-called break-bulk, that is, loose cargo not packed in containers. The load is then transported in the direction of the arrow P1 to a lift construction which is situated at a distance from the unloading bay 11 and which forms a vertical transport part of the second conveyor. This lift construction is also supplied on both sides by the two transport paths 13 of the horizontal transport part such that the load L can be pushed from two opposite sides into the lift construction and be placed on a horizontal transverse transport part 14 consisting of two sections. These sections operate in opposing directions as according to the arrow P3 such that the load can be carried to the end edge of each transport section. There the load can be taken over by land transport vehicles, for example forklift trucks, if the load is stowed on pallets.

It is noted that the lift construction 14 is arranged on the quay side of portal 1, as are the transport sections 14.

It is further noted that the girder 2 protrudes on the quay side so far outside portal 1 that it is possible

to set the load down directly from the trolley onto the quay to the side of the lift construction 14 and the transport sections 15.

As shown, the two transport paths 13 of the horizontal part run parallel at a mutual distance so that a vertical passage space becomes available therebetween. This makes it possible for the load L to be set down directly by the trolley hoist system onto the quay between the legs of the portal.

Nevertheless, for optimum use of the crane, use of the transfer station 11 is more advantageous since the trolley 2 makes fewer movements and therefore requires less unloading time.

The transport paths 13 and 14 can serve therein as buffer for adapting the unloading times by the land transport vehicles and those of the trolley 4.

Fig. 4 shows an embodiment wherein use is made of a lifting yoke 20 for suspending the cage 12 or the like which hangs using hoisting cables 21 from a hoisting platform 22 situated on the trolley.

The hoisting cables are guided on the hoisting platform such that the loose parts can extend to two points per side of the lifting yoke 20, whereby swinging of the lifting yoke relative to the trolley 4 is limited to a minimum. This improves the accuracy of placing of the load L on the unloading bay 11 which likewise results in considerable time-saving.

The cables 21 are wound onto winch drums 23 such that when the winch drums are driven synchronously all the cables are simultaneously paid out or drawn in. The cables are further guided on the trolley by means of the guide discs such that an equal free cable length between the point of attachment of the cables on the load and drum respectively is obtained for each pair.

According to a further development the points of attachment of the cable ends of the cables in each case of a pair can lie mutually staggered on the yoke, that is, at different distances relative to a side of the yoke 20, see points of attachment 24 and 25 in fig. 4. This compensates for the possible distance difference in the free cable length of those cables of the pair which are wound on the same drum 23, however at a distance from each other. This distance can be encountered again in the distance difference between the points of attachment 24, 25 relative to the side of the yoke 20. An exact free cable length is thus obtained for all the cables of a pair, whereby length differences as a result of temperature and load weight is kept the same for all cables. The yoke 20 will therefore not start to hang askew whereby it would be possible for a load to fall out of the open cage 12 during transport. Balancing yokes and the like are also not necessary.

It is finally noted that transport of the load along the second conveyor consisting of the path sections 13, 14 and 15 can take place in fully automated manner, because the transport paths and movements of

the conveyors along these paths can be fully synchronously adapted to each other.

A proposed embodiment of the transport member on the path section 13 is a carriage reciprocally movable along a guide and having blades similar to those of a forklift truck which can for instance lift up, fixedly hold and transport the pallets under the load.

the invention is not limited to the above described embodiment.

Claims

1. Gantry crane for loading/unloading cargo, packets or break-bulk, such as paper rolls, coils, drums, bundled timber and the like from ships, which crane comprises a portal, a girder supported by the portal and having a first horizontal transport path, a trolley provided with hoisting winches movable along this transport path, **characterized in that** the portal is provided with a transfer station at a lower level than the girder, wherein at least a second horizontal conveyor is arranged in the portal which extends between the transfer station and a delivery, receiving station at the level of the quay.
2. Gantry crane as claimed in claim 1, **characterized in that** the second transport path comprises a horizontal transport section with a vertical transport section connecting thereto.
3. Gantry crane as claimed in claim 2, **characterized in that** at least the horizontal portion of the second transport path consists of two or more transport paths.
4. Gantry crane as claimed in claim 2 or 3, **characterized in that** the transport path in the horizontal portion consists of a travel rail having thereon a reciprocally movable wagon or carriage provided with gripping means adapted to the load, such as a forklift device suitable for picking up load pallets.
5. Gantry crane as claimed in any of the foregoing claims, wherein the trolley in the first horizontal transport path is embodied with winch drums for winding hoisting cables in addition to guide discs for guiding the cables on the trolley, **characterized in that** the winch drums stand co-axially in line with each other and that in each case pairs of hoisting cables are arranged wherein the hanging part of the hoisting cable are fixed per pair to a hoisting yoke relative to the guiding discs such that the parts enclose an angle with the vertical to prevent swinging of the yoke, while retaining an equal free length of the cables per pair.

6. Gantry crane as claimed in claim 5, **characterized in that** the yoke is a rectangular framework and that in each case four pairs of hoisting cables are arranged which grip in each case onto a side of the yoke. 5
7. Gantry crane as claimed in claim 6, **characterized in that** the point of attachment of the cables of a pair relative to the side of the yoke are staggered in order to obtain an equal free length of the cables. 10

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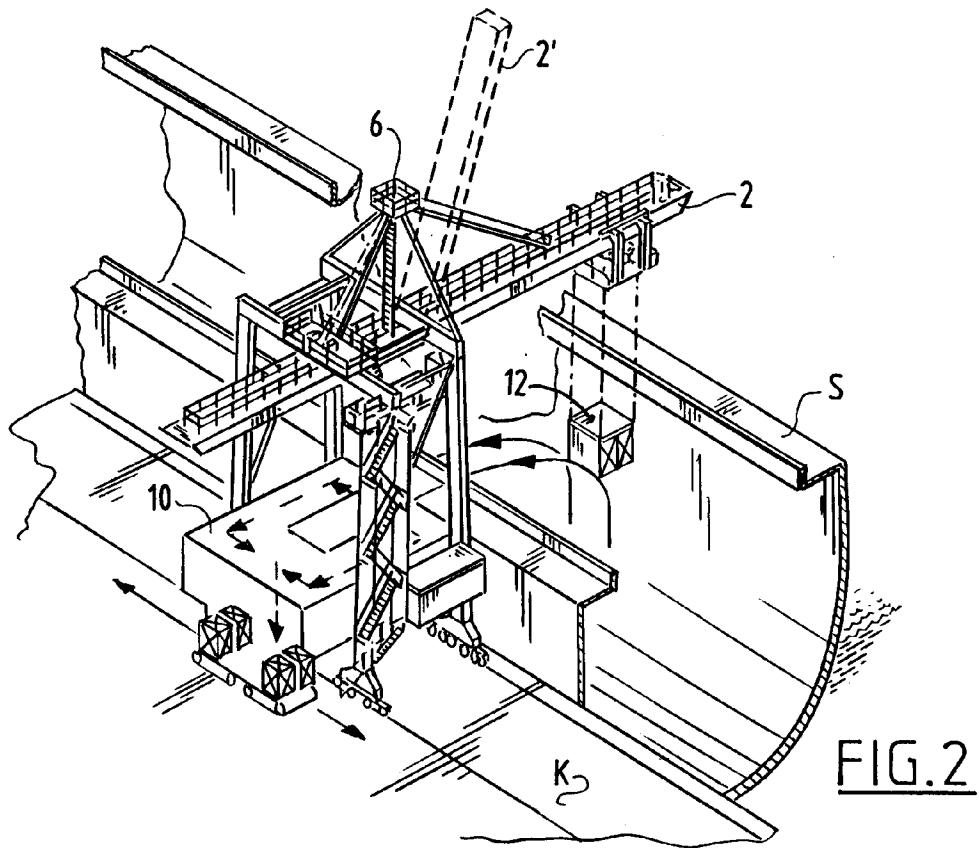
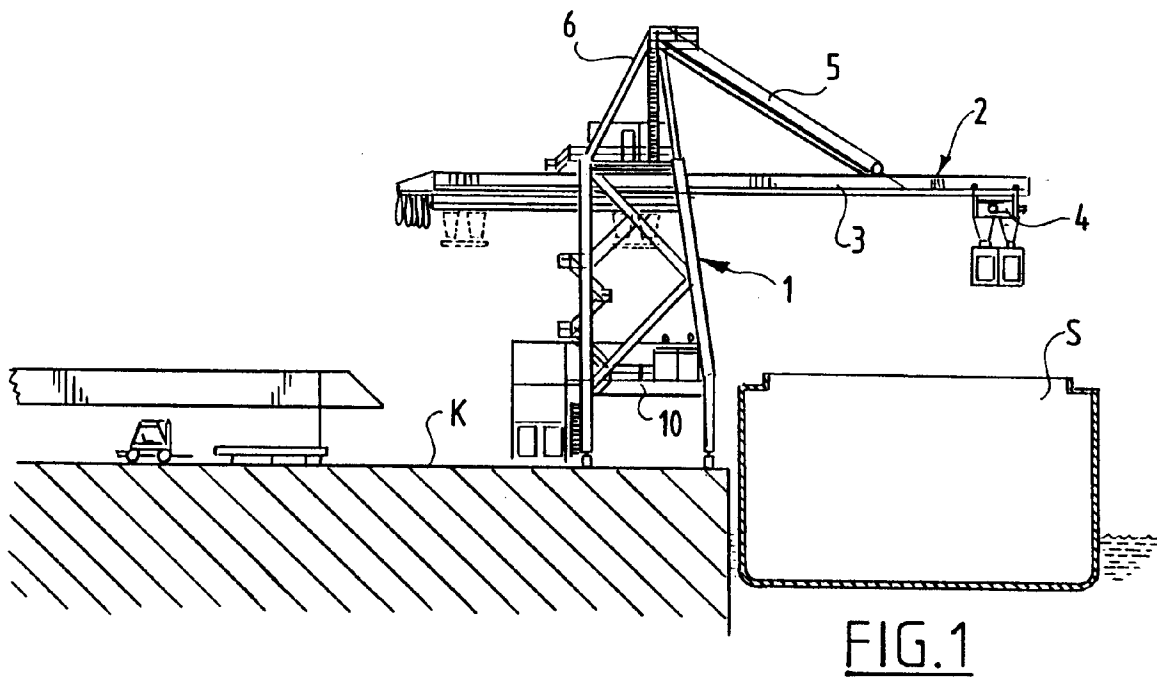
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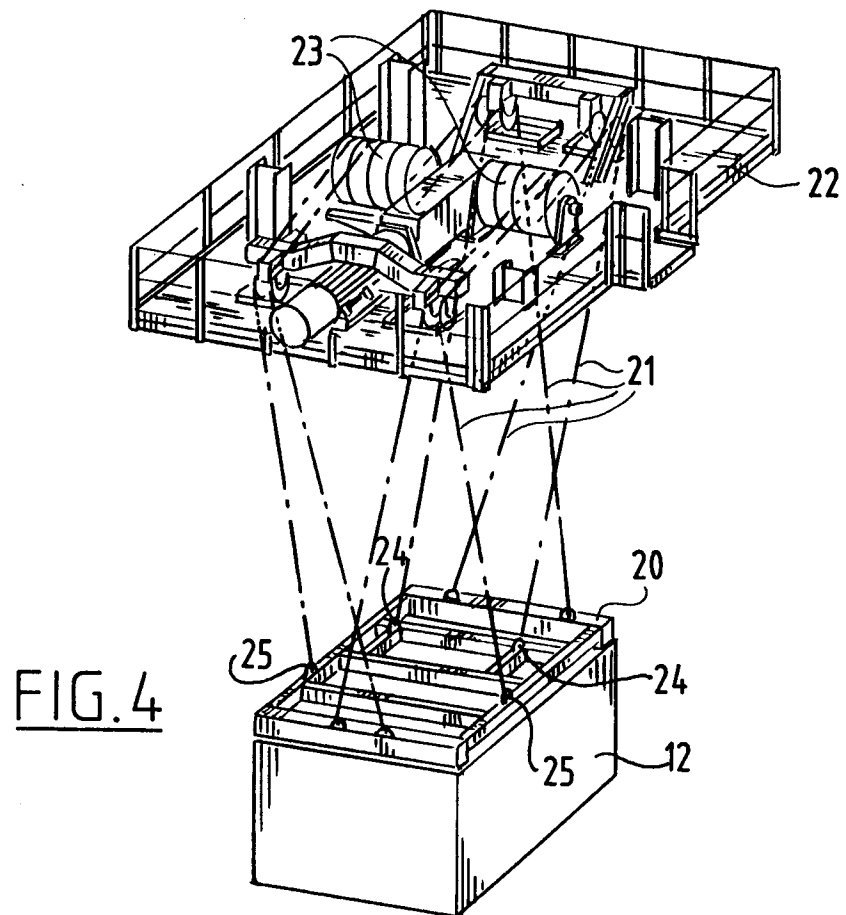
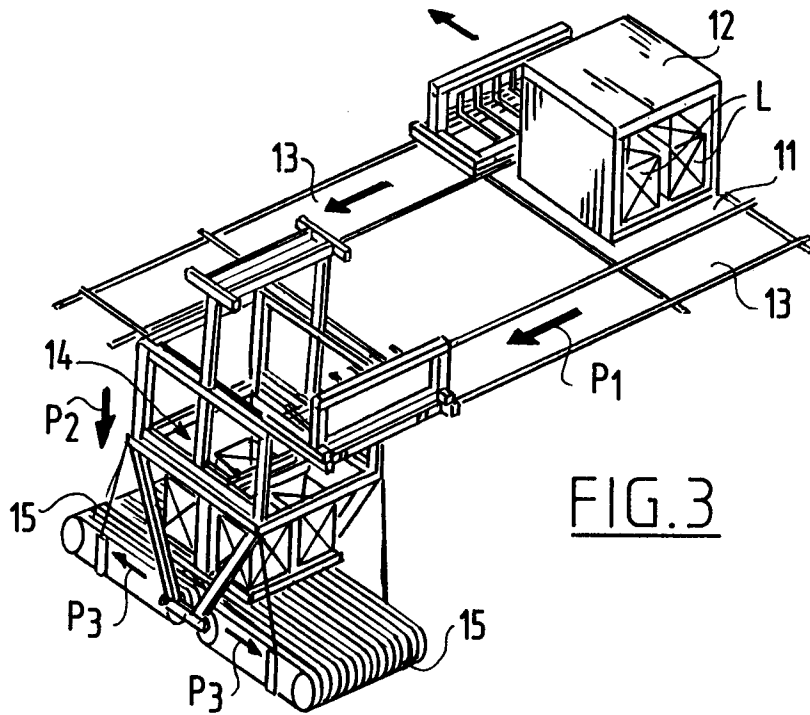
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EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0556

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	GB-A-2 029 374 (HITACHI LTD.) * figures * * page 2, line 61 - line 75 * * page 2, line 101 - line 119 * * page 3, line 1 - line 11 * * page 3, line 32 - line 41 * ---	1,2,3	B66C19/00
Y A	US-A-3 812 987 (WATATANI) * figures 2A,2B,4 * * column 4, line 36 - line 43 * * column 5, line 18 - line 68 * * column 6, line 11 - line 14 * ---	1,2,3 4	
Y	GB-A-1 346 520 (ANDERSSON) * page 2, line 106 - page 3, line 20 * * figures 1,2 * ---	1,2	
Y	US-A-4 973 219 (BRICKNER ET AL.) * figures 1,10,11 * * column 10, line 45 - column 11, line 19 * ---	1,2	
A	FR-A-1 549 447 (PACIFIC COAST ENGINEERING COMPANY) * page 6, left column, line 14 - line 29; figures * ---	1	
A	US-A-3 783 792 (CULLOM) * abstract; figures 1,2 * ---	2	
A	US-A-3 212 654 (DOLPHIN) * figures * ---	4	
A	EP-A-0 246 922 (ALBUS) * figures 1,2,7 * ---	5	
A	DE-A-2 502 713 (BROWN, BOVERI & CIE) * figure * -----	6	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01 JUNE 1993	Examiner GUTHMULLER J.A.
CATEGORY OF CITED DOCUMENTS		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	
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EPO FORM 1503 03.92 (P0401)