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(54) **Inland vessel with container lifting crane and a method for handling containers transported on inland waterways**

(57) An inland vessel for transporting containers (C), wherein the inland vessel (20) is provided with a container crane (22) and with a lifting platform assembly (34), wherein the lifting platform assembly (34) can be brought into a loading/unloading position in which a lifting platform

(42, 44) of the lifting platform assembly (34) links up with the quay (K) such that a container transporting means (38) can be driven thereon. Also, a method is disclosed for handling containers (C) that are transported on inland waterways while utilizing such an inland vessel (20).

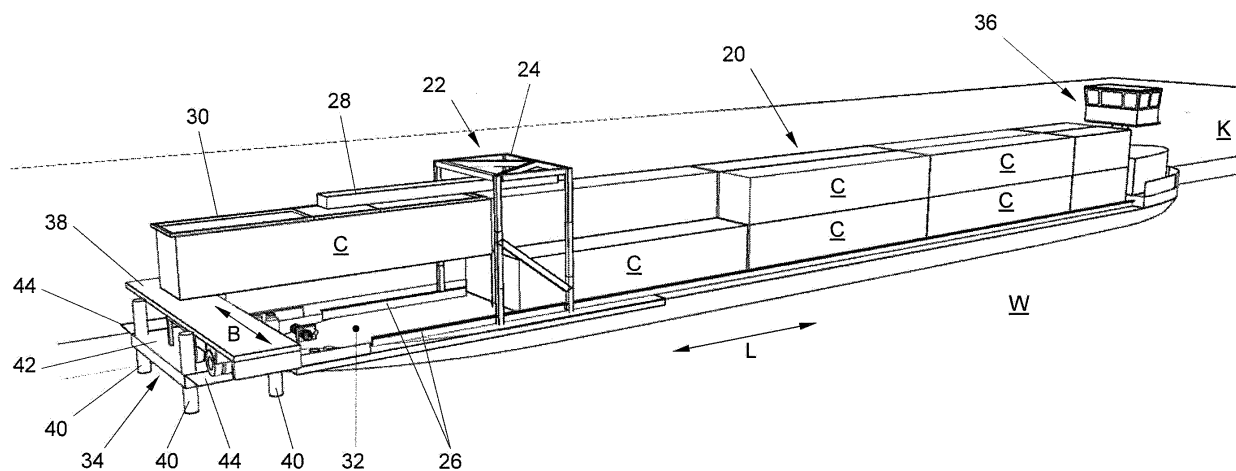


Fig. 1

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Description

[0001] The invention relates to an inland vessel with container lifting crane.

[0002] Such a vessel is known from NL1027326C. The inland vessel disclosed therein has a width of more than 11.45 meters, so that in the cargo hold of the inland vessel, four pallet wide containers can be placed next to each other in transverse direction.

[0003] However, in practice, there is also the need for inland vessels with a considerable smaller width for container transport. Here, vessels with a width of less than 8 meters can be involved. Like with the inland vessel described in NL1027326C, with such vessels too there is the need for unloading containers at quays which are not provided with container cranes.

[0004] The problem is, however, that a vessel whose width is smaller than 8 meters has insufficient stability for unloading containers therefrom with the aid of a crane placed on the vessel itself, even if the ship has an anti-rolling system as described in NL1027326C.

[0005] The object of the invention is to provide a solution to this problem, and to this end, provides an inland vessel for transporting containers, wherein the inland vessel is provided with a container crane and with a lifting platform assembly, while the lifting platform assembly can be brought into a loading/unloading position in which a lifting platform of the lifting platform assembly links up with the quay such that a container transporting means can be driven thereon.

[0006] The lifting platform offers the possibility to drive a container transporting means, such as a trailer of a truck, onto the lifting platform. As a result, the container transporting means can be positioned above the longitudinal axis of the vessel, so that the containers need not be unloaded sideways with a crane. As a result, the risk of the inland vessel heeling is minimized.

[0007] In an exemplary embodiment of the invention, the lifting platform assembly can be provided with spuds, which can be placed or introduced, respectively, on or into the waterway floor, while the lifting platform of the lifting platform assembly is height-adjustable relative to a lower end of the spuds.

[0008] Such a lifting platform assembly provided with spuds can be positioned in a stable manner relative to the quay. Surge and similar movements have no influence on the position of the lifting platform relative to the quay, in that the spuds can be introduced into the waterway floor or be placeable thereon. Also, driving a container transporting means onto the platform, and placing on, or removing a container from the container transporting means present on the lifting platform assembly does not result in large swinging movements of the vessel. The position of the lifting platform assembly itself relative to the quay remains stable because the lifting platform rests on the waterway floor with the aid of the spuds. Preferably, the positions of the spuds relative to the lifting platform can be controlled independently of each other,

so that the lifting platform can be set substantially horizontally, even when the waterway floor on which the spuds rest is not level. Optionally, the lifting platform assembly can be provided with ballast space that can be filled with water. To that end, the lifting platform assembly can also be provided with a pump, with which the ballast space can be rapidly filled and drained, for instance for evaluating whether the lifting platform assembly rests on a stable underground before the container transporting means is driven onto the lifting platform. The lower ends of the spuds can further be provided with support surface enhancing shoes. These shoes can optionally be size-adjustable. All this is for guaranteeing a stable support of the lifting platform assembly on the waterway floor.

[0009] In an exemplary embodiment of the invention, the loading/unloading position into which the lifting platform assembly can be brought and in which it links up with the quay can be located near an end face of the vessel.

[0010] As the lifting platform is positioned adjacent an end face of the inland vessel, a container crane present on the vessel can unload a container over an end face, i.e. the front or rear side of the vessel. The vessel is much more stable in this direction than when unloading over port or starboard. Due to the absence of the lifting platform, in spite of the fact that unloading or loading takes place over an end face of the vessel, the vessel can still moor parallel to the quay, so that blocking by the vessel of the waterway bounded by the quay is prevented.

[0011] According to a further elaboration, for optimizing the uses of the inland vessel, it is possible that the inland vessel be provided with a storage position for storing the lifting platform assembly.

[0012] Even with quays where no container crane is present, containers can be unloaded with the aid of the inland vessel. The fact is that the lifting platform assembly is always at hand because the inland vessel itself takes it along.

[0013] According to a further elaboration, it is advantageous when the container crane is designed for taking up the lifting platform assembly from the storage position and for bringing the lifting platform assembly to the loading/unloading position and vice versa.

[0014] The fact is that if the lifting platform assembly can be brought to the desired loading/unloading position by the container crane present on the vessel, a completely autonomous container transporting system for inland waterways is provided that can unload containers on quays where further no infrastructure other than a quay floor is present.

[0015] In one embodiment, the container crane can be a gantry crane. Such a crane has the advantage that the highest point thereof that is loaded by the weight of the container can be particularly low. This is contrary to a conventional swivel crane, positioned on a central point of the vessel, which has a considerable height because the swivel arm has to bridge the distance between the containers furthest from the central point and the crane

base.

[0016] Here, in one embodiment, the gantry crane can be movable in longitudinal direction of the vessel along a container hold of the vessel.

[0017] With such a movable, in particular drivable gantry crane, a container located adjacent the afterdeck can be taken up and transported to the forecastle. Here, the highest lifting force transmitting point of the gantry crane is relatively low, so that an optimal stability of the vessel is guaranteed. The height of the gantry crane is determined by the maximum stacking height of the containers.

[0018] In one exemplary embodiment, the gantry crane can be provided with a jib which extends substantially horizontally in the longitudinal direction of the vessel, while the gantry crane is provided with a lifting frame which is movable in the longitudinal direction along the jib and which is rotatable in a horizontal plane, while the length of the jib is such that a container carried by the lifting frame can be brought, through rotation of the lifting frame, from an orientation extending in the longitudinal direction to an orientation extending transversely to the vessel.

[0019] Here, the jib is preferably also movably connected in transverse direction to the gantry of the gantry crane. Thus, with a single jib, containers arranged, viewed transverse direction, one next to the other can be taken up successively. The fact is that the lifting frame connected to the jib can be positioned accurately, straight above a container to be taken up through movement of the jib in transverse direction.

[0020] With a thus designed gantry crane, a container transported to the forecastle can be rotated from a position in longitudinal direction of the vessel to a position transversely to the vessel, and which is above the platform assembly. Then, the container can be placed on a container transporting means, such as a trailer of a truck, located on the platform assembly.

[0021] To ensure that the required storage room for the lifting platform assembly on the vessel is not too large, in one embodiment, the lifting platform assembly can be provided with a lifting platform middle part provided at at least one end with a lifting platform lengthening part that is connected to the lifting platform middle part in a foldable or slidable manner.

[0022] The invention also provides a method for handling containers that are transported on inland waterways. The method comprises:

- providing an inland vessel according to the invention;
- mooring the inland vessel to a quay;
- bringing the liftable lifting platform assembly in a loading/unloading position in which the lifting platform of the lifting platform assembly links up with the quay;
- bringing a container transporting means onto the lifting platform assembly; and
- taking up a container from the inland vessel with the aid of the container crane and placing this container

on the container transporting means, or taking a container from the container transporting means with the aid of the container crane and placing this container on the inland vessel.

[0023] With such a method, containers can be loaded and unloaded with the aid of a relatively narrow inland vessel. Here, inland vessels with a width smaller than 12 meters can be involved, more particularly inland vessels with a width in the range of 6 - 8.5 meters. As the containers need not be discharged over a side of the vessel with a swivel crane, but can be placed on a container transporting means located above the central line of the vessel, the risk of the vessel capsizing is reduced to a minimum. The fact is that during the lifting operation with the crane present on the vessel the container can be held in the proximity of the longitudinal center plane of the vessel.

[0024] In one embodiment of the method, the lifting platform assembly can be provided with spuds, while bringing the lifting platform assembly in the loading/unloading position mentioned, in which the lifting platform of the lifting platform assembly links up with the quay also comprises placing the lower ends of the spuds on the waterway floor or introducing them into the waterway floor.

[0025] As with such a method, the lifting platform assembly rests on the waterway floor, the container transporting means driving onto and from the lifting platform and placing the containers onto the lifting platform does not lead to a rolling movement of the vessel.

[0026] The lifting platform assembly can be provided with a ballast space in which water can be pumped. To that end, the lifting platform of the lifting platform assembly can for instance be designed as a hollow sandwich. After placement on the waterway floor, the ballast space can be pumped full of an amount of water, for instance 35 tons. When, thereupon, the lifting platform assembly retains a stable position, the water can be pumped from the ballast space again and the container transporting means can be driven onto the lifting platform assembly. The risk of the lifting platform assembly sinking away as a result of a container transport means driving thereon and then placing a container thereon is thus minimized.

[0027] According to a further elaboration, the loading/unloading position in which the lifting platform of the lifting platform assembly links up with the quay can be located adjacent an end face of the vessel.

[0028] When loading and unloading containers over an end face of the vessel, the vessel still retains sufficient stability. The fact is that in the longitudinal direction, the inland vessel is much more stable.

[0029] For creating an inland water container transporting system that can function without infrastructure on the quay, in one exemplary embodiment, the method can comprise:

- providing an inland vessel according to claim 4; and

- taking up the lifting platform assembly from a storage position on the inland vessel with the aid of the container crane for the purpose of bringing the lifting platform assembly to the loading/unloading position.

[0030] Presently, the invention will be further elucidated on the basis of an exemplary embodiment, with reference to the drawing.

Fig. 1 shows a perspective view of an exemplary embodiment of an inland vessel;

Fig. 2 shows a perspective view of the front of the inland vessel shown in Fig. 1 with a lifting platform assembly in a storage position;

Figs. 3 - 6 show the unloading and bringing the lifting platform assembly to a loading/unloading position adjacent the end face, more particularly the front of the inland vessel;

Figs. 7 - 11 show the unloading of a container from the vessel onto a container transporting means arranged on the lifting platform assembly.

[0031] The exemplary embodiment shown in Fig. 1 shows an inland vessel 20, moored by a starboard side to a quay K which bounds a waterway W. The inland vessel 20 is loaded with containers C. The inland vessel 20 shown is so narrow that only two rows of containers can be arranged next to each other. The vessel can for instance be of the Kempenaar-type. The inland vessel 20 is provided with a container crane designed as a gantry crane 22. The gantry crane 22 is provided with a gantry 24. The gantry is drivable over rails 26 along the hold of the vessel in the longitudinal direction L of the vessel. The gantry crane 22 is further provided with a jib 28. It is preferred that the jib 28 is connected to the gantry 24 for movement in longitudinal direction L and in transverse direction B. In the jib 28 there is a crab (not shown) to which a lifting frame 30 is connected through lifting cables or lifting chains (not shown). Adjacent an end face of the inland vessel, the front in the present exemplary embodiment, there can be a storage position 32 for a lifting platform assembly 34. In an alternative embodiment, the end face can be the rear side of the vessel. In the exemplary embodiment shown, a pilot house 36 is provided adjacent a rear of the vessel. In an alternative embodiment, such a pilot house 36 can also be provided adjacent a front of the vessel. The pilot house 36 can for instance be height-adjustable for seeing over the containers C, with the pilot house in a highest position, when the inland vessel 20 is fully loaded. When the inland vessel is not fully loaded, the pilot house 36 can be brought to a lower position.

[0032] In Fig. 1, the lifting platform assembly 34 has already been placed on the waterway floor and a container transporting means 38 is located on the lifting platform assembly 34. The container transporting means 38 can for instance be a trailer of a truck. However, also other container transporting means are possible, such as a straddle carrier or similar means. The lifting platform

assembly 34 can be provided with a number of spuds 40. Such spuds 40 can be introduced into the waterway floor or rest thereon. The lifting platform assembly 34 is further provided with a lifting platform comprising a lifting platform middle part 42 and two lifting platform lengthening parts 44. Instead of two, only one or no lifting platform lengthening part 44 at all can be provided. In the present exemplary embodiment, the lifting platform lengthening parts 44 are connected to the lifting platform middle part 42 for upward and downward pivotal movement. In an alternative embodiment, the lifting platform lengthening parts can be slideably connected to the lifting platform middle part 42. The vertical position of the lifting platform middle part 42 is adjustable relative to the lower ends of the spuds 40. To that end, the spuds 40 may be designed to be telescopic. It can thus be effected that the lifting platform assembly 34 can be stored in a compact manner in the storing position 32 on the inland vessel 20. It is furthermore effected that the lifting platform assembly 34 can be deployed at different quay heights relative to the waterline. Apart from the telescopic design of the spuds 40, the adjustability of the lifting platform middle parts 42 relative to the underside of the spuds can also be obtained through an adjustable connection between the lifting platform middle part 42 and the spuds 40, for instance an adjustable connection via toothed rack/sprocket assemblies or the like.

[0033] Presently, on the basis of Figs. 2 - 10, the method of unloading will be described.

[0034] Fig. 2 shows the lifting platform assembly 34 in the storage position 32 on the inland vessel 20 adjacent the forecastle. Clearly visible is that the lifting platform lengthening parts 44 are folded upwards and that the lifting platform middle part 42 is located adjacent an underside of the spuds 40. The lifting frame 30 rests on the lifting platform middle part 42.

[0035] Fig. 3 shows the condition in which the lifting platform assembly 34 is lifted by the gantry crane 22 and is brought, via the jib 28, above the forecastle adjacent the end face and is rotated there, such that the lifting platform assembly extends with a central line in the transverse direction B of the inland vessel 20.

[0036] Fig. 4 shows the following condition in which the gantry 24 of the gantry crane 22 has been driven a bit further in the direction of the end face, so that now, the lifting platform assembly 34 is suspended above the water adjacent the end face of the vessel 20.

[0037] Fig. 5 shows the condition in which the lifting platform assembly 34 is placed on the waterway floor. The spuds 40 can be designed to be telescopic, so that they can be lengthened and be brought from a retracted condition (Figs. 2 - 4) to a folded out condition (Figs. 5 - 11). With the spuds 40 in the folded-out condition, the lower ends thereof rest on the waterway floor. Furthermore, the lifting platform middle part 42 is preferably vertically adjustable relative to the lower ends of the spuds 40 such that the lifting platform middle part 42 can be positioned at the desired height relative to the quay K

and be set horizontally. In Fig. 5, the lifting platform lengthening parts 44 are still in a folded-up condition.

[0038] Figs. 6 and 7 show the following condition in which the platform lengthening parts 44 are folded down. Figs. 6 and 7 also show that a container transporting means 38 has driven onto the lifting platform assembly 34. Meanwhile, the gantry crane 22 has been rolled back and is now located with the lifting frame 30 above a container C to be unloaded.

[0039] Fig. 8 shows that the gantry crane 22 has taken up a container C with the lifting frame. The crab of the gantry crane 22 to which the lifting frame 30 is attached is now at the free end, reaching to the front, of the jib 28. The container C is in an intermediate position and is brought from a position with the longitudinal axis in longitudinal direction L to a position with the longitudinal axis in transverse direction B.

[0040] Fig. 9 shows that the container C is rotated a complete quarter of a turn and presently extends with the longitudinal axis in the transverse direction B.

[0041] Fig. 10 shows that the container C is placed on the container transporting means 38 and that the lifting frame 30 is uncoupled.

[0042] Fig. 11 shows that the transporting means has driven from the lifting platform assembly 34 and is located on the quay K.

[0043] Loading an inland vessel is carried out accordingly, albeit in reverse order.

[0044] The above-given further elucidation of the invention based on the exemplary embodiment is not to be construed to be limitative in any manner. The scope of protection is determined by the appended claims and the description and the drawing serve as explanation of these claims. The object of the claims is also to comprise a variant with which the lifting platform assembly cannot be placed on the waterway floor but instead thereof rests on the inland vessel. The variant shown, where the lifting platform assembly can indeed be placed on the waterway floor, is however preferred because here, no compensation for rocking of the ship is to be effected.

[0045] A further object of the claims is to comprise a variant wherein the loading/unloading position in which the lifting platform for the lifting platform assembly links up with the quay is between the end faces of the vessel, for instance approximately in the middle of the vessel. This has as an advantage that, on average, the container crane, preferably designed as gantry crane needs to travel a smaller distance over the vessel. Such a lifting platform assembly could be stored in a storage position approximately in the middle of the vessel. The lifting platform could furthermore be provided with spuds with the aid of which the lifting platform assembly rest in the loading/unloading position mentioned on the waterway floor.

[0046] The large flexibility of the disclosed container transporting concept, while utilizing relatively narrow inland vessels is the central point.

Claims

1. An inland vessel for transporting containers (C), wherein the inland vessel (20) is provided with a container crane (22) and with a lifting platform assembly (34), wherein the lifting platform assembly (34) can be brought into a loading/unloading position in which a lifting platform (42, 44) of the lifting platform assembly (34) links up with the quay (K), such that a container transporting means (38) can be driven thereon.
2. An inland vessel according to claim 1, wherein the lifting platform assembly (34) is provided with spuds (40) which can be placed or introduced, respectively, on or into the waterway floor, wherein the lifting platform (42, 44) of the lifting platform assembly (34) is height-adjustable relative to a lower end of the spuds (40).
3. An inland vessel according to claim 1 or 2, wherein the loading/unloading position into which the lifting platform assembly (34) can be brought and in which it links up with the quay is located adjacent an end face of the vessel (20).
4. An inland vessel according to any one of claims 1 - 3, wherein the inland vessel (20) is provided with a storage position (32) for storing the lifting platform assembly (34).
5. An inland vessel according to claim 4, wherein the container crane (22) is designed for taking up the lifting platform assembly (34) from the storage position (32) and for bringing the lifting platform assembly (34) to the loading/unloading position and vice versa.
6. An inland vessel according to any one of claims 1 - 3, wherein the container crane is a gantry crane (22).
7. An inland vessel according to claim 6, wherein the gantry crane (22) is provided with a jib (28) which extends substantially horizontally in the longitudinal direction (L) of the vessel (20), wherein the gantry crane (22) is provided with a lifting frame (30) which is movable in longitudinal direction along the jib (28) and which is rotatable in a horizontal plane, wherein the length of the jib (28) is such that a container (C) carried by the lifting frame (30) can be brought through rotation of the lifting frame (30) from an orientation extending in the longitudinal direction (L) to an orientation extending in the transverse direction (B) of the vessel (20).
8. An inland vessel according to claim 6 or 7, wherein the gantry crane (22) is movable in longitudinal direction of the vessel (20) along a container hold (46) of the vessel (20).

9. An inland vessel according to any one of the preceding claims, wherein the lifting platform assembly (34) is provided with a lifting platform with a lifting platform middle part (42) provided at at least one end with a lifting platform lengthening part (44) which is connected in a foldable or slidable manner to the lifting platform middle part (42). 5
10. A method for handling containers (C) that are transported on inland waterways, wherein the method comprises: 10
- providing an inland vessel (20) according to any one of the preceding claims;
 - mooring the inland vessel (20) to a quay (K); 15
 - bringing the lifting platform assembly (34) in a loading/unloading position in which the lifting platform (40, 42) of the lifting platform assembly (34) links up with the quay (K);
 - bringing a container transporting means (38) onto the lifting platform assembly (34); and 20
 - taking up a container (C) from the inland vessel (20) with the aid of the container crane (22) and placing this container (C) on the container transporting means (38), or taking up a container (C) 25 from the container transporting means (38) with the aid of the container crane (22) and placing this container (C) on the inland vessel (20).
11. A method according to claim 10, wherein the lifting platform assembly (34) is provided with spuds (40) and wherein bringing the lifting platform assembly (34) in the said loading/unloading position in which the lifting platform (40, 42) of the lifting platform assembly (34) links up with the quay also comprises placing the lower ends of the spuds (40) on or introducing these into the waterway floor. 30 35
12. A method according to claim 10 or 11, wherein the loading/unloading position in which the lifting platform (40, 42) of the lifting platform assembly (34) links up with the quay is located adjacent an end face of the vessel (20). 40
13. A method according to any one of claims 10 - 12, wherein the method also comprises: 45
- providing an inland vessel (20) according to claim 4; and
 - taking up the lifting platform assembly (34) from a storage position (32) on the inland vessel (20) with the aid of the container crane (22) for the purpose of bringing the lifting platform assembly (34) to the desired loading/unloading position. 50 55

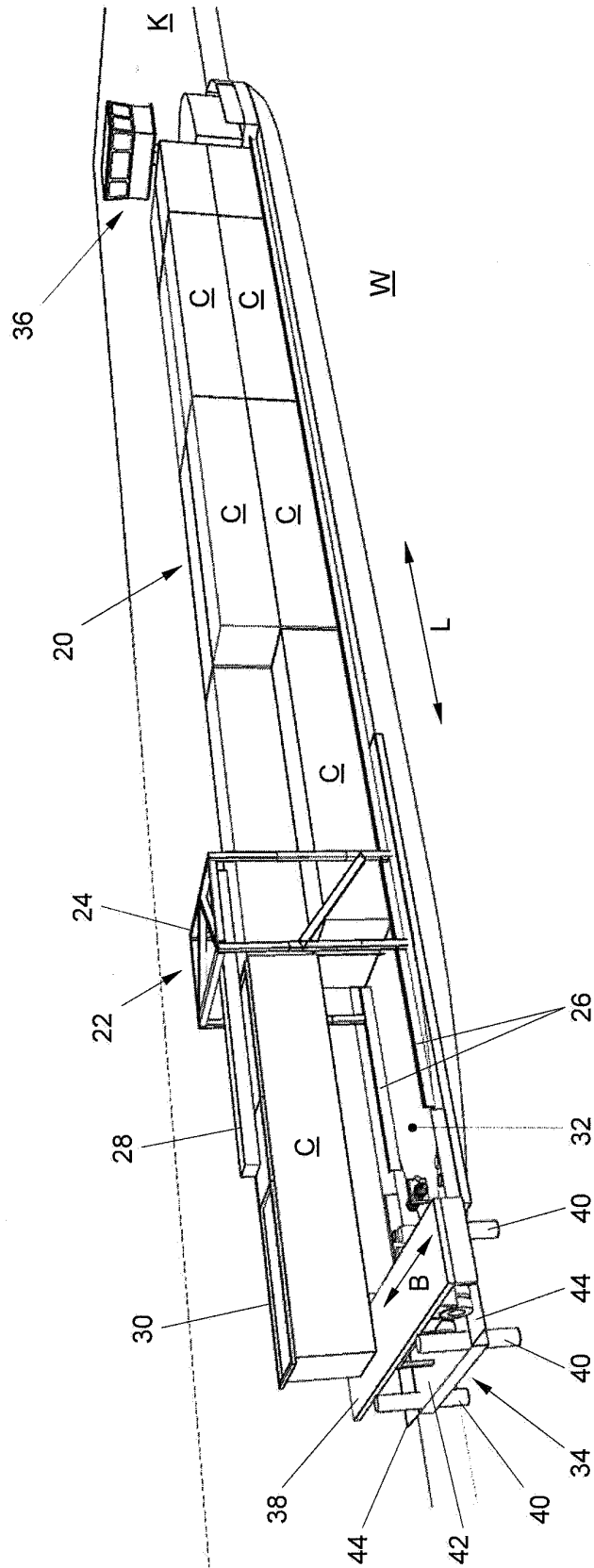


Fig. 1

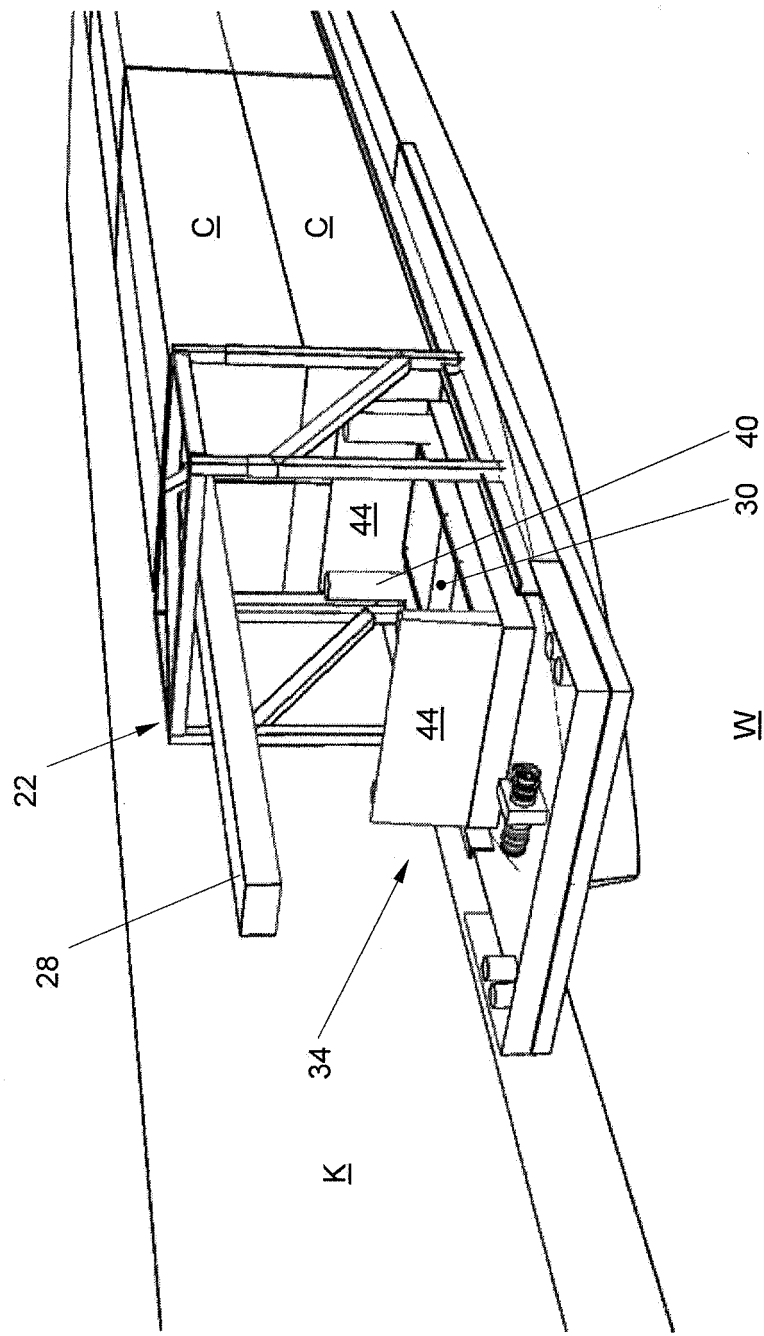


Fig. 2

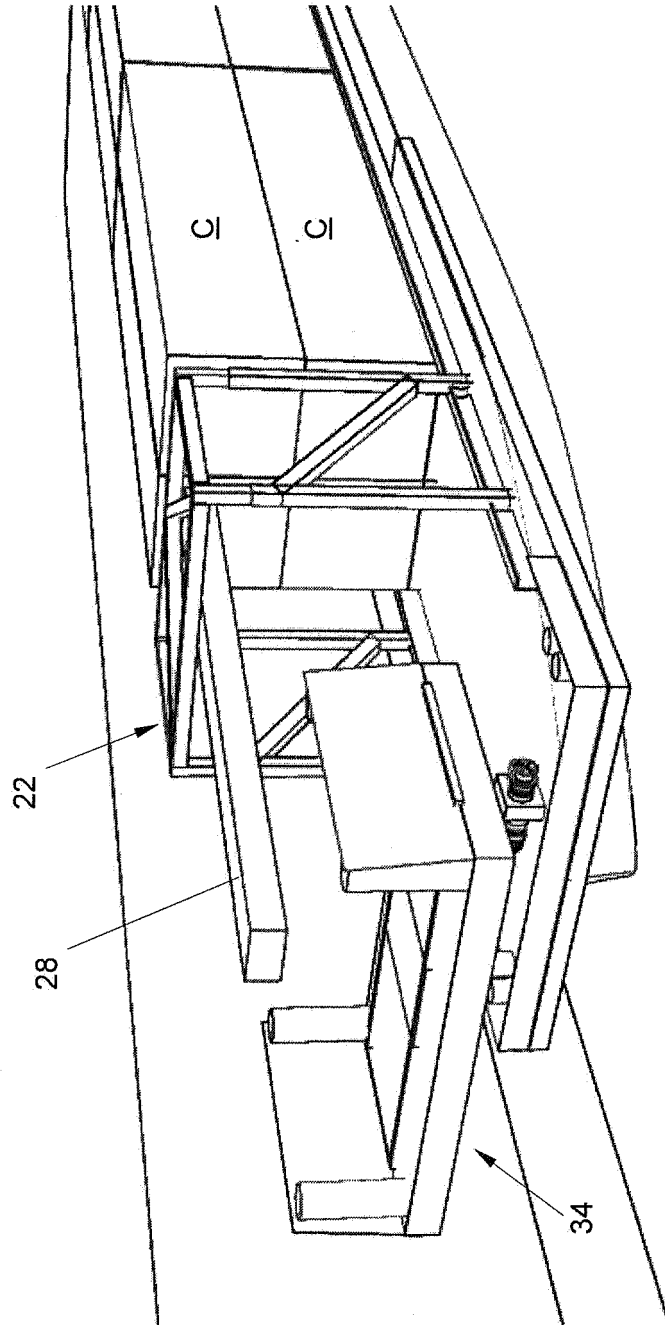


Fig. 3

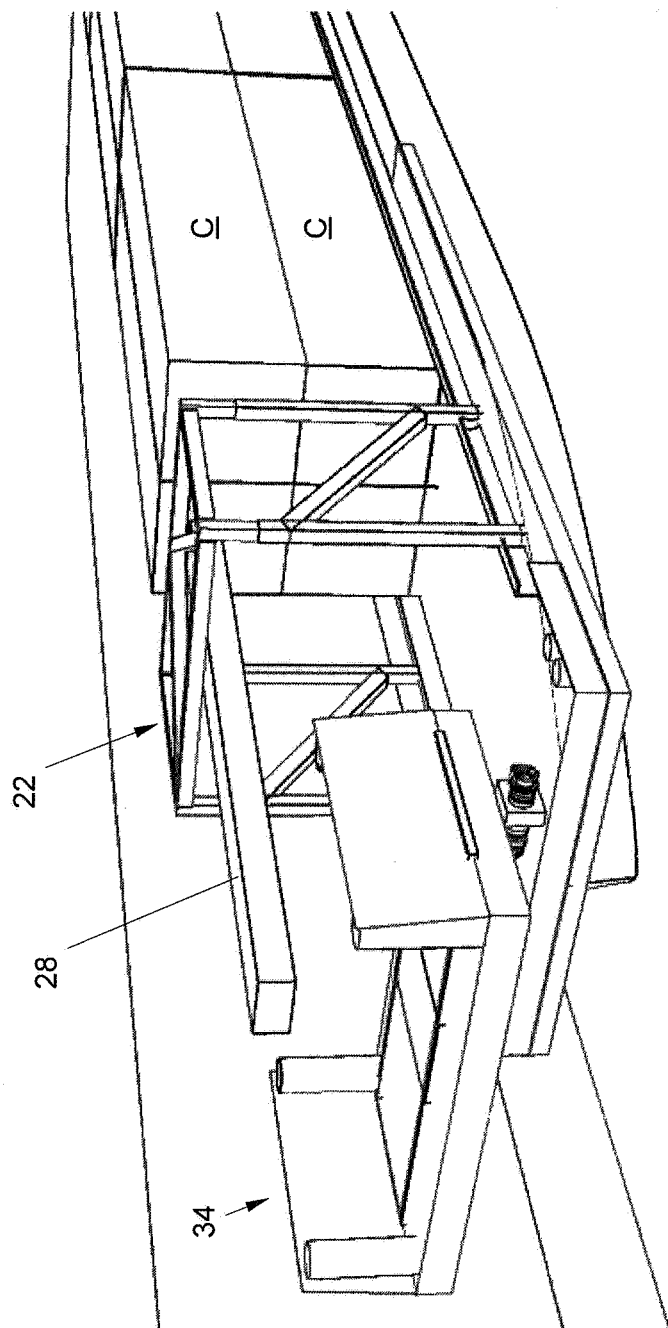


Fig. 4

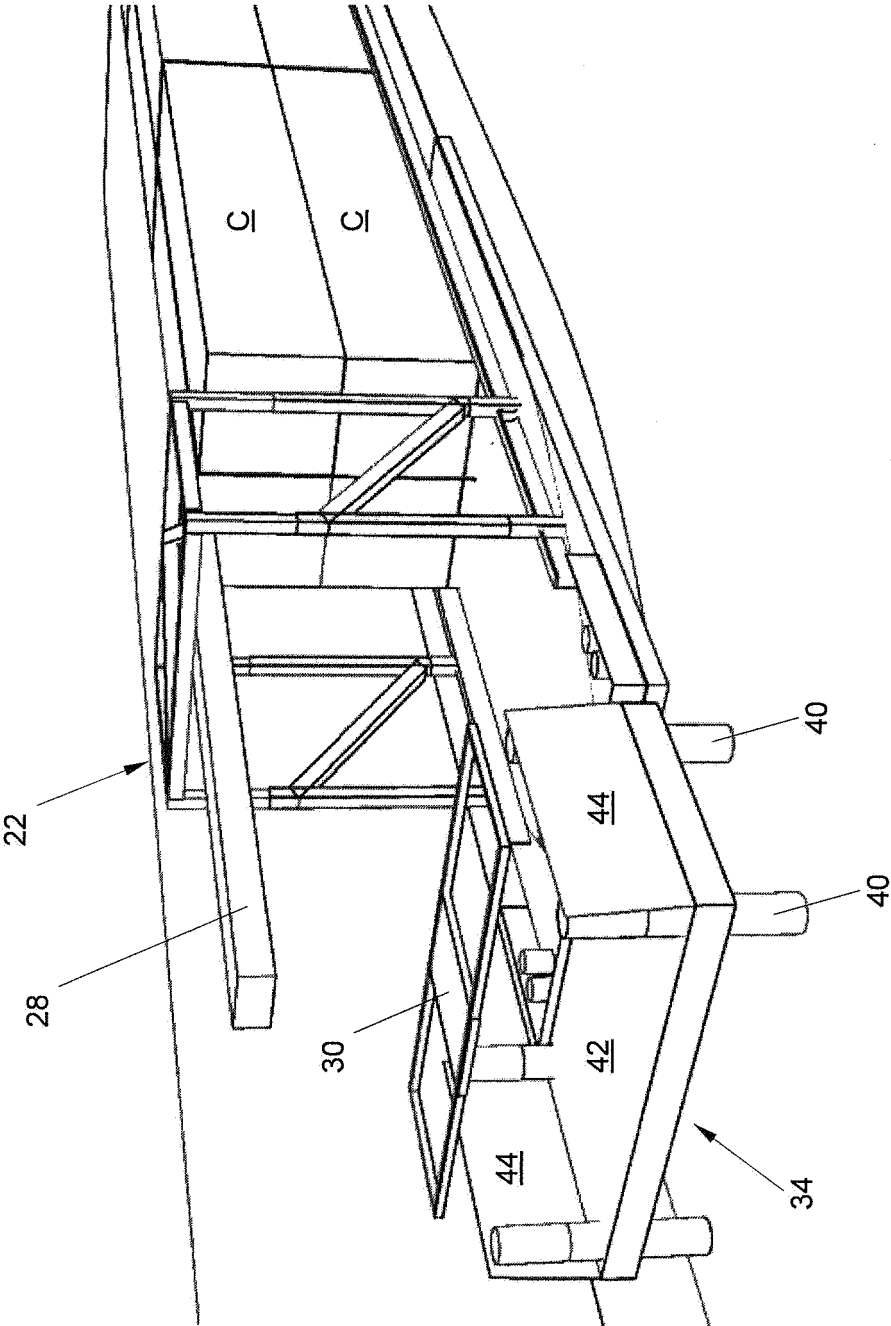


Fig. 5

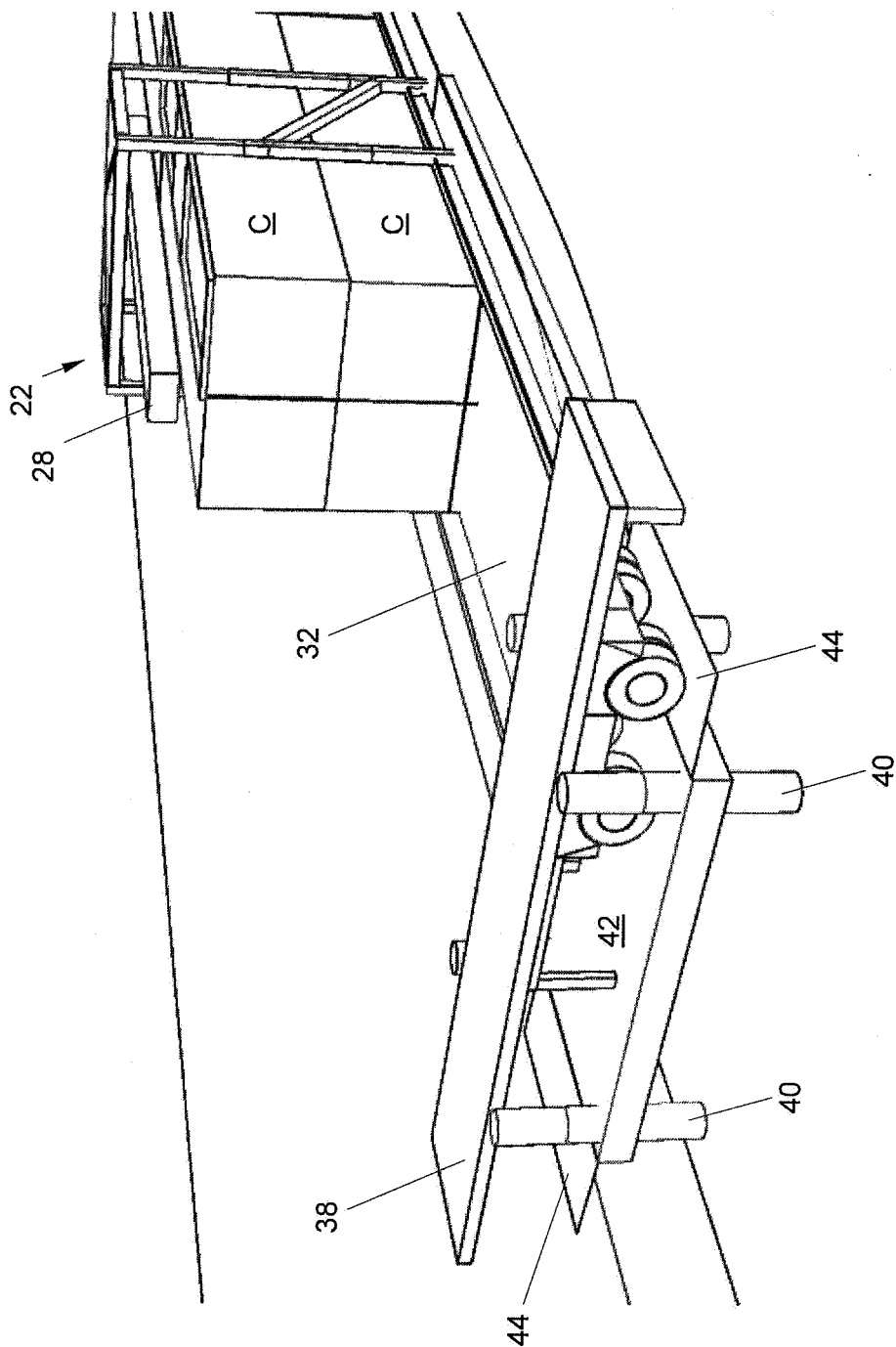


Fig. 6

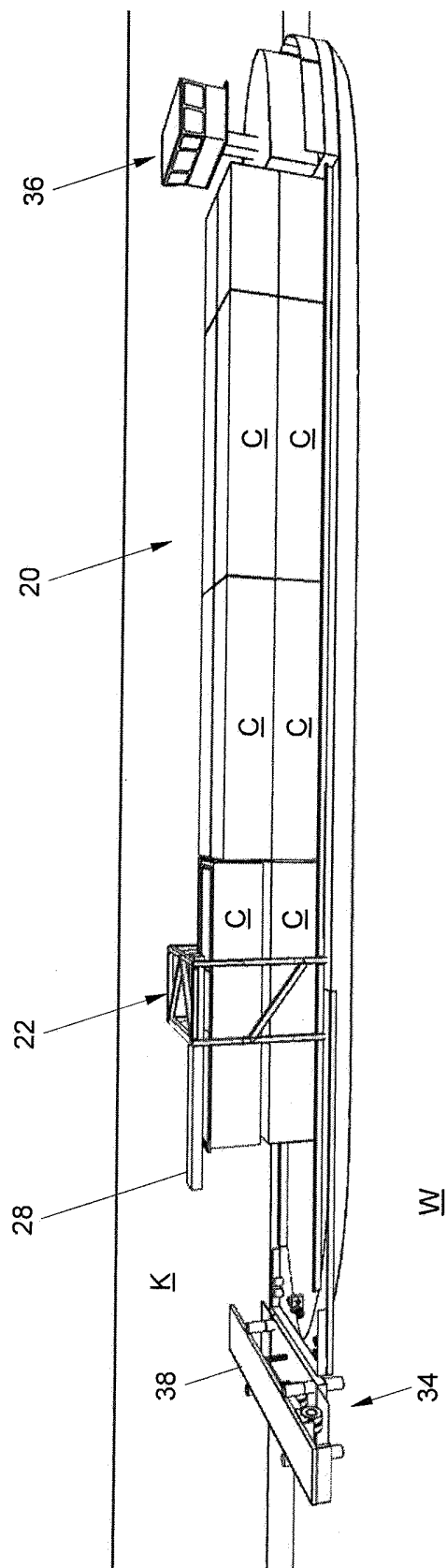


Fig. 7

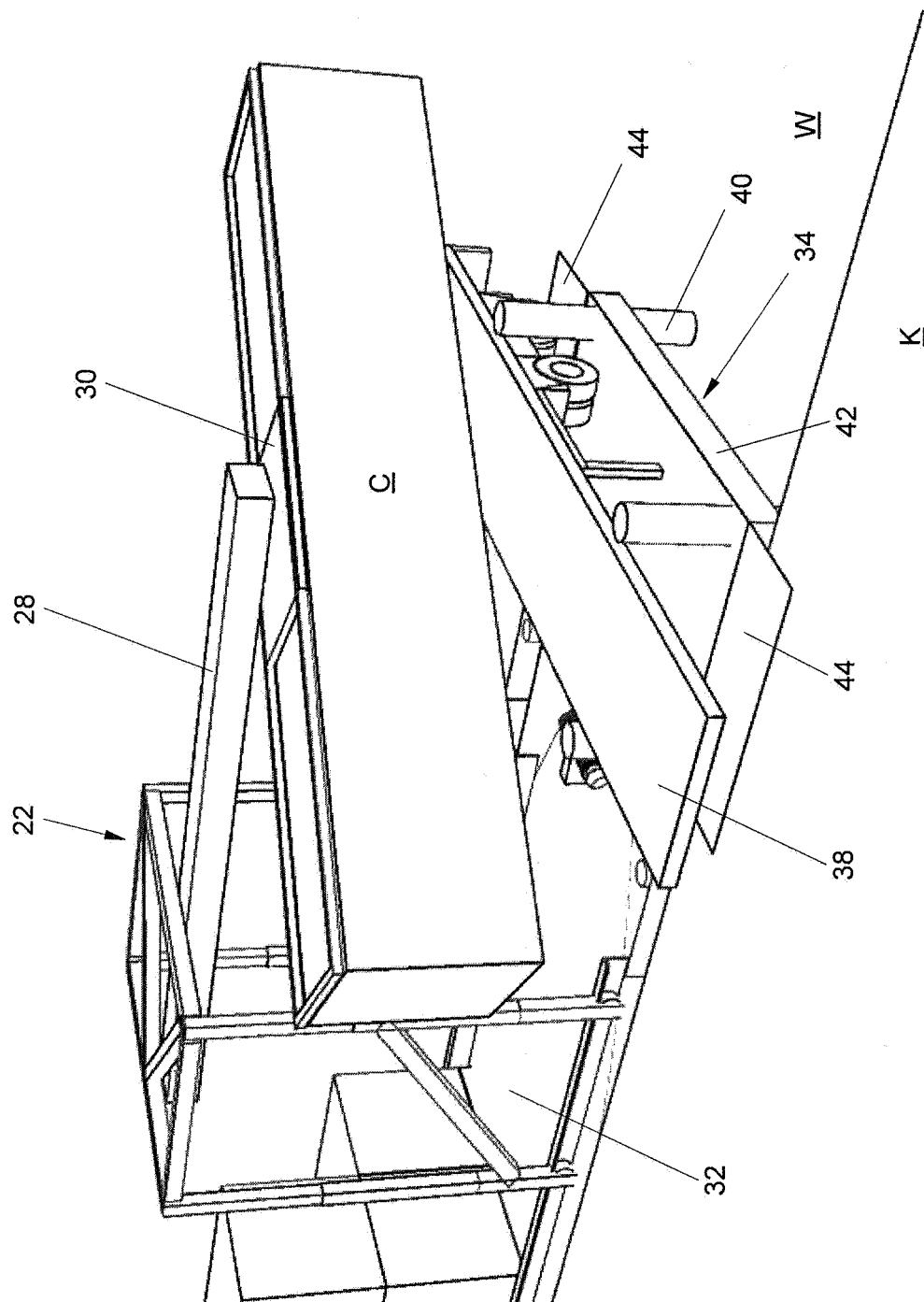


Fig. 8

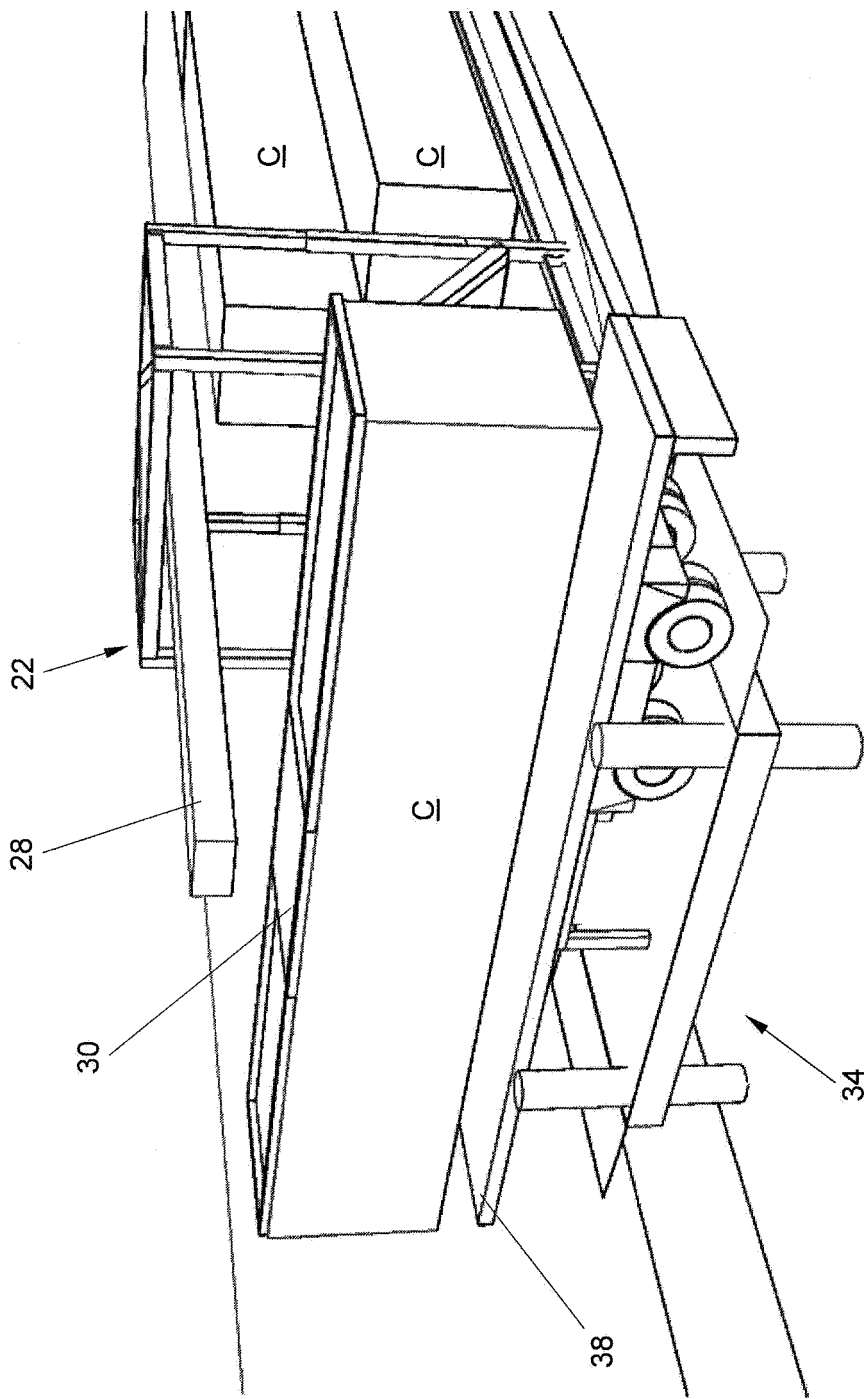


Fig. 9

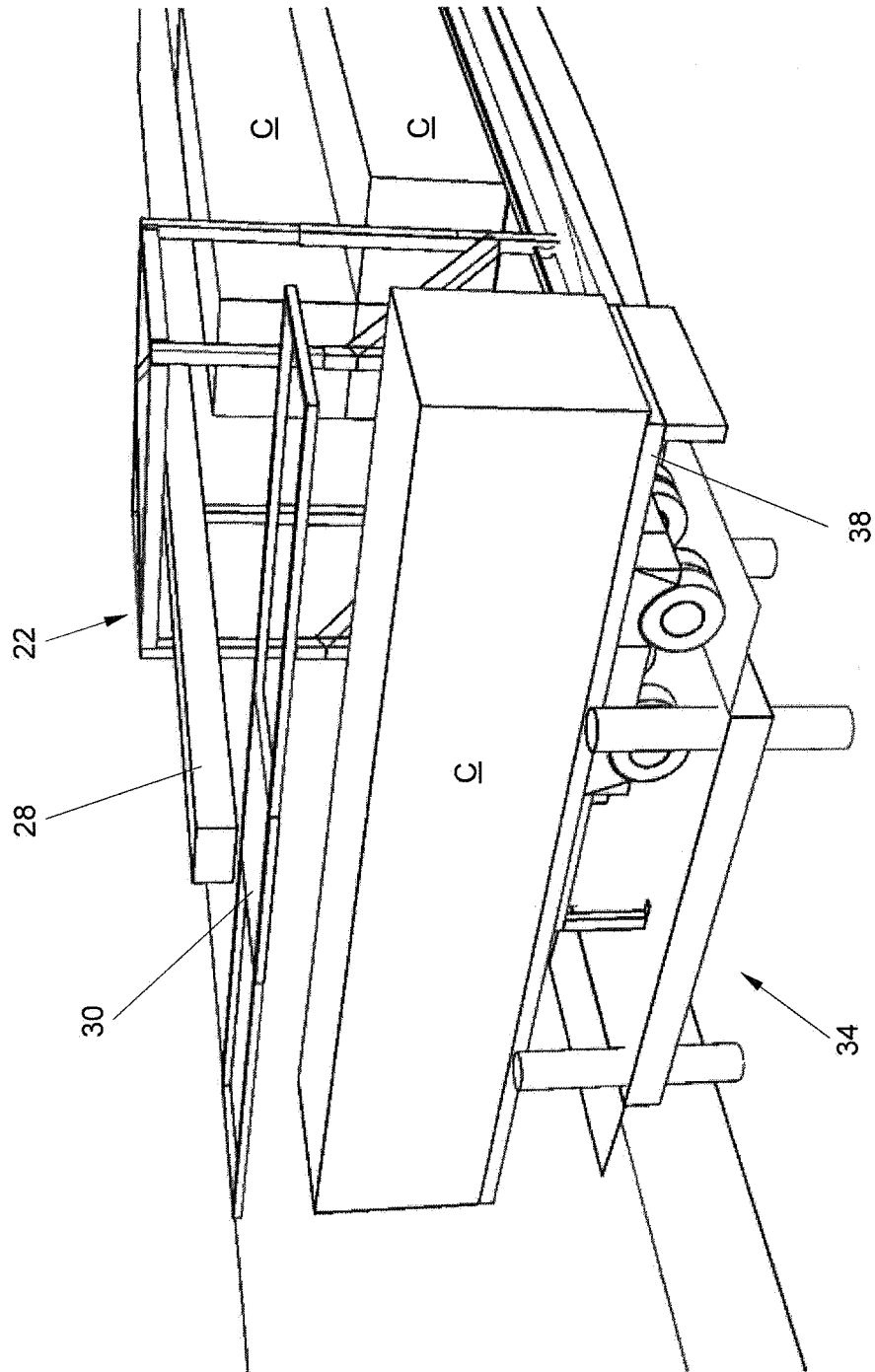


Fig. 10

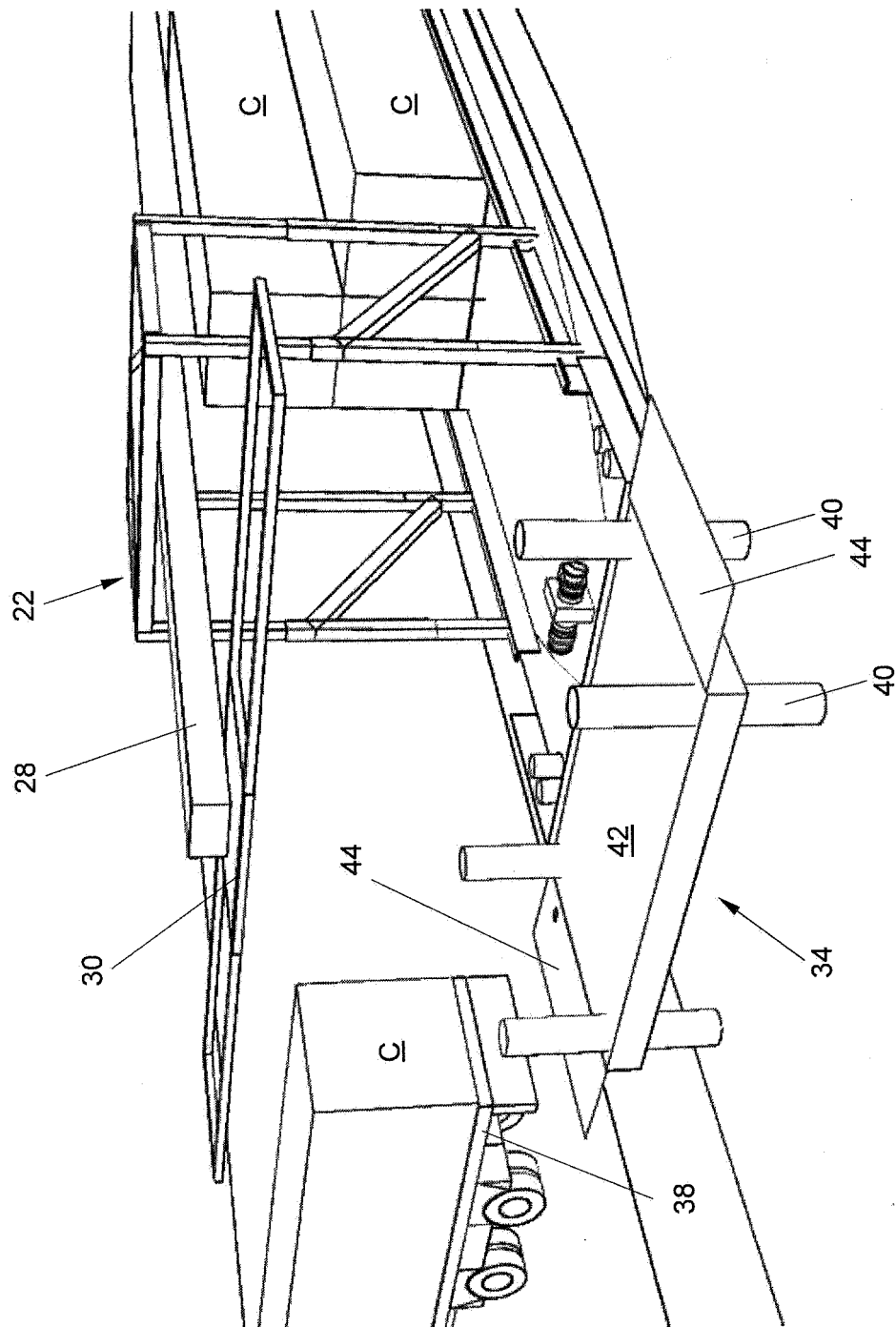


Fig. 11



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Application Number
EP 08 15 2339

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Place of search Munich		Date of completion of the search 2 July 2008	Examiner Moya, Eduardo
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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