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Empty container storage for the intermediate Storage of empty ISO containers

Description

The invention relates to an empty container store for the temporary storage of empty ISO containers, in particular in fully automatic container terminals of sea ports or river ports, having a gantry bridge crane which can be automated, spans the empty container store, can be moved on an elevated craneway and having a traveling crab which can be moved thereon in the longitudinal direction thereof and to which a vertical lifting column or a load receiving means which can be lifted and lowered and is intended for the empty container is fastened.

While fully automatic container terminals are becoming evermore widespread, empty container stores are currently only operated manually and cannot therefore be integrated into the fully automatic terminals controlled by superior storage logistics. The stacking and transporting of the empty containers takes place by means of reach stackers, fork lift trucks or similar mobile equipment which also undertake the transportation between the empty container store and the container storage modules.

The object of the present invention is to provide an empty container store which can be integrated into the fully automatic operation of a container terminal in order thereby to increase the handling capacity in comparison with the manually operated empty container store without additional costs.

In order to achieve this object, an empty container store is proposed according to the invention which is characterized in that the load receiving means is a spreader which is arranged on a spreader carriage, which is guided on the lifting column by means of rollers, on a spreader support.

The gantry bridge crane, which spans the entire empty container area and on which the stacking crane can be moved, is the basis of the system according to the invention. Gantry bridge cranes are known in principle and are available in a well-developed form. Elevators on a craneway enable the necessary stacking height of up to 8 containers which are stacked one above another to be reached, said containers being able to be picked up and lowered by the load receiving means which can be moved up and down on the vertical lifting column. The lifting column itself is part of the traveling crab which can be moved on the gantry bridge crane, and so every space of the



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empty container store can be reached by moving both the gantry bridge crane and the traveling crab.

The vertical lifting column advantageously comprises a lattice mast structure having preferably three booms on which the load receiving means is guided in a vertically moveable manner. The lattice mast, which is triangular in cross section, is, on the one hand, lightweight and, on the other hand, is sufficiently stable in order to hold the load receiving means together with the load and to guide it on the lifting column.

According to a further feature of the invention, the spreader carriage can be moved vertically on the lifting column by means of a double-cable lifting mechanism, deflection rollers for the cables being provided on the lifting column. The spreader for the ISO containers is arranged on a spreader support, which can be spread apart by the spreader carriage, and is set up in such a manner that it is able to grasp the different sizes of container.

According to another feature of the invention, it is provided that the spreader support with the spreader in the vertical longitudinal central plane of the spreader carriage can be pivoted from a position near to the lifting column into a position remote from the lifting column. This ability to pivot is used for the operation, which will be described later, of the load receiving means which is thereby capable of putting down or picking up the container at a certain distance from the lifting column.

The spreader support is advantageously connected to the spreader carriage via parallel links which can be pivoted by means of a piston/cylinder unit. The parallel link guide makes possible an essentially horizontal movement of the spreader support and therefore a favorable guiding of the load, spreader and empty container carrying out a curved movement as a function of the length of the parallel links.

The length of the parallel links and the pivoting movement thereof are coordinated with one another in such a manner that, according to a further feature of the invention, the spreader support together with the spreader in its pivoting position remote from the lifting column can be pivoted out to such an extent that when the lifting column is in a position near to the craneway rail, the spreader reaches through the posts of the craneway. This feature makes it possible to pivot with the spreader into a position which is arranged outside the empty container store. In this manner, containers which are stacked or transported outside the empty container store can be picked up or empty containers can be transferred out of the empty container store in order to be picked up outside the store.

When stacking the containers in the empty container store at a height of up to eight containers, at least the first stacking row may become unstable in the case of wind loads. In order to prevent this, according to a further feature of the invention, it is proposed that a bearing framework is provided in order to stabilize at least the first row of the container stacks in the region near to the craneway, said bearing framework comprising vertical columns or supports, the height of which corresponds to the height of the containers which can be stacked up to the maximum and the horizontal clearance of which is smaller than the longitudinal extent of the shortest container to be stacked, at least one lane being formed between two columns or supports through which even the longest container can be withdrawn in its transverse direction. The vertical pillars or supports, which are preferably embedded in the ground, prevent the stack from falling over and at the same time enable the containers to be withdrawn in a relatively large intermediate space between the columns or supports.

Finally, it is proposed, in addition, for the sorting in the container store to take place in accordance with size, height and design of the ISO containers. Since, as is known, the standard sizes of containers differ in terms of length and height, the containers have to be sorted in order to form stable and orderly stacks. Moreover, standard containers, open-top containers, tank containers, bulk material containers and flads are in each case stacked separately, it also being possible to deposit the containers of diverse shipping firms in collective positions.

The present invention is advantageous because it provides the necessary supplementation to the fully automatic container store for a fully automatic container terminal. When the automatic stacking crane is used, the handling capacity is increased significantly in comparison to the manually operated empty container store without additional costs in comparison with the manual store arising.

An exemplary embodiment of the invention will be illustrated in the drawing and described below. In the drawing:

Figure 1 shows a section through a container store with an integrated empty container store,

Figure 2 shows the container store according to figure 1 during the construction of the first row of empty containers,

Figure 3 shows a further section through the container store according to figure 1,

Figure 4 shows the empty container storage module,

Figure 5 shows a detailed view of the spreader support in the position with minimal projection,

Figure 6 shows a detailed view of the spreader support in the position with maximum projection, and

Figure 7 shows a section through the three-boom mast above the spreader carriage.

In figure 1, a cross section through an empty container storage module 1 according to the invention with adjacent container storage modules 2 is illustrated. In the empty container storage module 1, a stacking crane 3, which moves on the elevated craneways 4, serves the empty container store 5. The stacking crane 3 comprises the gantry-like bridge 6 and the crab 7. The main components of the crab are the three-boom mast 7.1, the double-cable lifting mechanism 7.2, the spreader carriage 7.3 and the spreader 7.4, which is mounted in a floating manner, in the position of minimum projection.

In figure 2, a section through the container store having an integrated empty container store according to figure 1 is likewise illustrated. The figure shows the empty container storage module 1 and the stacking crane 3 operating therein during construction of the first row of empty containers 8 in the empty container store 5. A bearing framework 9, which comprises supports embedded vertically in the ground, is used for stabilizing the first row. For this normal stacking activity, the spreader 7.4 is situated within the empty container store 5 in the position of minimum projection.

Figure 3 shows the empty container storage module 1 and the stacking crane 3 operating therein in a loading region 10 outside the empty container store 5 during the transfer of an empty container 11 from the first row of the adjacent container storage module 2. For this handling activity outside the empty container store 5, the spreader 7.4 has been pivoted into the position of maximum deflection.

In figure 4, a further section through a container store having an integrated empty container store is illustrated. The figure shows the empty container storage module 1 and the stacking crane 3 therein in a loading region 12 outside the empty container store during the transfer of an empty container 13 from a driverless transport vehicle 14. For this handling activity outside the empty container store 5, the spreader 7.4 has been pivoted into the position of maximum projection.

The spreader support and the positions of minimum and maximum projection are illustrated in figures 5 and 6. Figure 5 shows the spreader carriage 7.3 comprising the guide frame 15, the strut links 16, the parallel links 17, the spreader support 18 and the spreader 7.4, which is mounted in a floating manner. The two lifting cylinders 19 determine the minimum end position of the spreader. By means of two cables 20 of the double lifting mechanism 7.2 the spreader carriage is moved for positioning in the vertical direction along the three-boom mast 7.1.

Figure 6 shows the spreader carriage 7.3 in its maximum projection. The lifting cylinders 19 are completely extended, as a result of which the parallel links 17 and the strut links 16 pivot to the left in the drawing and therefore move the spreader support into a position in which it is remote from the three-boom mast.

Figure 7 shows the three-boom mast 7.1, the double-cable lifting mechanism 7.2 and the spreader carriage 7.3 in cross section. The spreader carriage, which is guided on two double T supports 22 by four rollers 21 is suspended on the two lifting cables 20 and can be moved vertically on the three-boom mast by means of a lifting mechanism (not illustrated).

In order to stack the empty containers in the empty container store 5, the crab 7 moves together with the three-boom mast 7.1, which is arranged thereon, for example into the position illustrated in figure 3, the spreader 7.4 in its maximum projection reaching through the elevated craneway. The spreader picks up an empty container 11 and moves the latter through a lane formed between the craneway supports into the region of the empty container store 5. A first row 8 of empty containers, which is supported by the bearing framework 9, is stacked there, as illustrated in figure 2. Further rows are formed in the same manner (figure 1), the spreader 7.4 being positioned in the position according to the projection.

As described previously, the empty containers can be lifted off a driverless transport vehicle or can be placed thereon, as is illustrated schematically in figure 4. The sorting in the store expediently takes place according to container types, i.e. according to sizes (20', 30', 40', 45', 48', 50'), according to height (4', 4'6'', 8', 8'6'', 9', 9'6'' and 9'6½''), design (standard container, open-top container, tank container, bulk material container and flads), and according to owners (diverse shipping firms).

The container store according to the invention operates fully automatically in accordance with an established program and can be integrated into the sequence of an automatic container terminal.

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Patent Claims

1. An empty container store for the temporary storage of empty ISO containers, in particular in fully automatic container terminals of sea ports or river ports, having a gantry bridge crane (6) which can be automated, spans the empty container store (1), can be moved on an elevated craneway (4) and having a traveling crab (7) which can be moved thereon in the longitudinal direction thereof and to which a vertical lifting column (7.1) for a load receiving means (7.3, 7.4) which can be lifted and lowered and is intended for the empty container (8, 11, 13) is fastened, characterized in that the load receiving means is a spreader (7.4) which is arranged on a spreader carriage (7.3), which is guided on the lifting column (7.1) by means of rollers (21), on a spreader support (18).

2. The empty container store as claimed in claim 1, characterized in that the vertical lifting column (7.1) is formed from a lattice mast structure having preferably three booms on which the load receiving means (7.3, 7.4) is guided in a vertically moveable manner.

3. The empty container store as claimed in claim 1 or 2, characterized in that a double-cable lifting mechanism (7.2) having deflection rollers provided on the lifting column (7.1) is provided for the vertical moving of the spreader carriage (7.3).

4. The empty container store as claimed in one of claims 1 to 3, characterized in that the spreader support (18) with the spreader (7.3) in the vertical longitudinal central plane of the spreader carriage (7.3) can be pivoted from a position near to the lifting column (7.1) into a position remote from the lifting column (7.1).

5. The empty container store as claimed in one of claims 1 to 4, characterized in that the spreader support (18) is connected to the spreader carriage (7.3) via parallel links (17) which can be pivoted by means of at least one piston/cylinder unit (19).

6. The empty container store as claimed in one of claims 1 to 5, characterized in that the spreader support (18) together with the spreader (7.3) in its pivoting position remote from the lifting column (7.1) can be pivoted out to such an extent that when the lifting column (7.1) is in a position near to the craneway rail, the spreader (7.4) reaches through the posts of the craneway (4).

7. The empty container store as claimed in one of claims 1 to 6, characterized in that a bearing framework (9) is provided in order to stabilize at least the first row (8) of the container stacks in the region near to the craneway (4), said bearing framework comprising vertical columns or supports, the height of which corresponds to the height of the containers (13) which can be stacked up to the maximum and the horizontal clearance of which is smaller than the longitudinal extent of the shortest container (13) to be stacked, at least one lane being formed between two columns or supports through which even the longest container (13) can be withdrawn in its transverse direction.