

Store, in particular store arrangement, in particular store for containers

Description:

The invention relates to a store, in particular a store arrangement, in particular a store for containers.

It is generally known that objects can be stored in and removed from a store.

An object of the invention is therefore to develop a store having a very high throughput of objects.

The object is achieved according to the invention with a store in accordance with the features set out in claim 1.

Important features of the invention in the store, in particular in the store arrangement, in particular in the store for containers, are that the store has identical modules which are arranged so as to be stacked one on the other, wherein a maximum of n modules are arranged so as to be stacked one above the other, in particular therefore the store has n floors which are formed by modules, wherein the store has unloading regions which comprise less than n modules which are stacked one above the other, in particular therefore have a height, in particular a floor height, of less than n modules which are stacked one above the other, wherein n is a whole number greater than 1.

It is advantageous in this instance that an unloading region is able to be associated with each floor and consequently rapid and simple storage or removal of a container is enabled.

The term container is intended to be understood to refer not only to conventional containers for ship transport, but also other containers which can accordingly be received with a vehicle, and which can be stored on the support portions of the modules.

Containers are intended in this instance to be understood also to refer to Euro pallets, Euro-pool pallets or other load receiving means.

In an advantageous embodiment, the quantity of floor heights of the unloading regions of the store has the whole numbers from $n_{\min}$ to $n-1$ or to n , in particular wherein the floor height, in particular stack height, corresponds to the number of modules which are stacked one above the other in each case, in particular wherein $n_{\min}$ is a whole number which is smaller than n , in particular wherein $n_{\min}$ corresponds to the floor height which is arranged in a recessed manner in the floor. It is advantageous in this instance that rapid storage and removal of the containers is enabled since either the container is stored on the support portions of the module and later transported away by a vehicle or the vehicle is already waiting in the unloading region for the next container which it deposits after receiving on the same floor. Consequently use of the lift is only required in special cases.

In an advantageous embodiment, the respective floor height of the unloading regions decreases in a monotonous manner from an unloading region of maximum height as the distance increases, in particular in a horizontal direction,
5 in particular in a horizontal longitudinal direction and in a horizontal transverse direction.

In an advantageous embodiment, the respective module, in particular the uppermost of the modules which are stacked
10 one above the other, is open in an upward direction, in particular therefore can be filled from the top with a container, in particular which can be deposited in this instance on a support portion. It is advantageous in this instance that rapid loading can be carried out with a crane
15 from a vertical direction.

In an advantageous embodiment, the module in each case has a base plate and columns which are secured thereto and which in particular are each of the same length, in
20 particular double T-carriers, in particular with an additional module being able to be placed on the columns. It is advantageous in this instance that the module can be produced in a simple manner.

25 In an advantageous embodiment, the container which is stored on the support portion is spaced apart from the base plate in such a manner that a vehicle can be driven at least partially below the container,
in particular wherein the vehicle has a lifting mechanism
30 by means of which the container is arranged so as to be raised from the support portion when the lifting mechanism is deployed. It is advantageous in this instance that simple transport of the container is enabled.

In an advantageous embodiment, the vehicle together with the container received on the lifting mechanism of the vehicle can be moved on the base plate of the module in a horizontal longitudinal direction and/or transverse direction through the module. It is advantageous in this instance that rapid transport through the store to the provided storage location is enabled.

In an advantageous embodiment, a primary conductor for inductive power supply of the vehicle is arranged in the base plate,

in particular wherein the vehicle has at the lower side thereof a secondary winding which can be coupled to the primary conductor in an inductive manner so that energy can be transmitted,

in particular wherein a capacitor is connected in series or in parallel to the secondary winding in such a manner that the associated resonance frequency substantially corresponds to the frequency of the alternating current which has been introduced into the primary conductor. It is advantageous in this instance that a contactless transmission of energy is enabled.

In an advantageous embodiment, the module has a primary conductor portion which is spaced apart from the base plate for inductive supply of a consumer, in particular a cooling unit, of a container,

in particular wherein the container has at the side thereof a secondary coil which can be coupled in an inductive manner to the primary conductor portion so that energy can be transmitted,

in particular wherein a capacitor is connected in series or in parallel to the secondary coil in such a manner that the associated resonance frequency substantially corresponds to the frequency of the alternating current which has been impressed into the primary conductor,
in particular wherein the secondary coil current of a voltage adapter unit is supplied in order to supply the consumer with electrical power. It is advantageous in this instance that a consumer of the container can also be supplied with electrical power after storage, that is to say, after the vehicle has been removed.

In an advantageous embodiment, there is arranged at the upper end region of the module, in particular at the upper end region of a column, a plug type connector portion and, at the lower end region of the module, in particular at the lower end region of a column, a corresponding plug type mating connector portion,
in particular in such a manner that, when the modules are stacked one on the other, the plug type mating connector portion is connected in a plugged manner in the plug type connector portion. It is advantageous in this instance that the electrification can automatically be produced with the production of the store.

In an advantageous embodiment, two adjacent modules are connected to each other in a positive-locking manner in each case, in particular there is arranged at a respective side of the module a groove, in particular a groove which is formed in a dovetail-like manner, so that a wedge can be introduced into two grooves which are adjacent to each other. It is advantageous in this instance that an orientation and

connection are enabled in a simple and sustainably stable manner.

5 In an advantageous embodiment, the primary conductor comprises in the base plate portions which extend in the longitudinal direction and transverse direction. It is advantageous in this instance that the vehicle can be supplied with electrical energy in a contactless manner not only when passing through the module, but also when a
10 container is deposited in a laterally orientated manner.

In an advantageous embodiment, a respective support portion is arranged on the base plate.

15 In an advantageous embodiment, the store has a covering plate which has a machine compartment, a wind generator and/or a solar generator. It is advantageous in this instance that the store can be supplied at least partially with regenerative energy sources.

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In an advantageous embodiment, the store has in a lift region an additional module which has in the base plate thereof a recess which is so large that a container can be moved through the recess by means of a lifting mechanism,
25 in particular wherein the module has one or more door elements, in particular a rolling door and/or a sliding door. It is advantageous in this instance that the safety can be increased.

30 Furthermore, all the modules have columns of the same length which are secured to a base plate whose outer dimensions are identical in all modules.

Other advantages will be appreciated from the dependent claims. The invention is not limited to the feature combination of the claims. For the person skilled in the art, other advantageous combination possibilities of claims and/or individual claim features and/or features of the description and/or the Figures are evident, in particular from the problem addressed and/or the problem which is addressed as a result of comparison with the prior art.

The invention is now explained in greater detail with reference to drawings.

Figure 1 is an oblique view of two modules of a container store,

Figure 2 is an oblique view of a cut-out of the container store which comprises eight modules 111,

Figure 3 is a plan view of a cut-out of the container store, there being shown in each case four modules 111 which are each connected to each other in a positive-locking manner and which each have a plug type connector portion 6 for electrical power supply,

Figure 4 shows a module 110 for the lift region,

Figure 5 shows a module which in contrast to the module 111 additionally has a laterally arranged primary conductor portion 50 so that a container having an electrical consumer can be supplied with electrical power in an inductive manner,

Figure 6 is an oblique view of a module 111,

Figure 7 shows a roof plate module having a machine compartment 71,

Figure 8 shows a roof plate module having solar generators 81,

Figure 9 shows a roof plate module having wind power generators 91,

Figure 10 shows a module which forms a travel region,
Figure 11 is a cross-section through the store,
Figure 12 shows another store system.

The container store is constructed from modules 111. Each of these modules 111 has a base plate 3 having a travel surface, a driverless transport system (DTS) and/or an automatically guided vehicle (AGV) being able to be moved on the travel surface.

Owing to the modular structure of the store, the store can be extended in a vertical direction and in all horizontal directions by adding and connecting additional modules 111.

The vehicle which is used as a DTS or AGV has an electric motor which is coupled from a secondary winding which is coupled to the primary conductor in an inductive manner.

Preferably, a capacitor is connected to the secondary winding in series or in parallel in such a manner that the associated resonance frequency substantially corresponds to the frequency of the alternating current which is impressed into the primary conductor.

The vehicle has a lifting mechanism so that the vehicle, when the lifting mechanism is retracted, can travel below a container which has been positioned in a jacked up state and can then receive and transport it by deploying the lifting mechanism.

The base plate 3 has steel and concrete.

At the corners of the base plate which is constructed in a substantially rectangular manner, there are arranged columns of the same length which are preferably constructed as double T-carriers.

Consequently, at the upper end of the columns, an additional identical module 111 can again be positioned.

The module has in the base plate 3 a primary conductor so that the vehicle can be supplied with electrical power in an inductive manner. In addition, the vehicle also has an energy store in order to travel short distances even without an inductive power supply or to smooth electrical peak loads.

The vehicle may, on the one hand, move longitudinally through the module 111 along the primary conductor 4 and, on the other hand, transversely. During the movement in the transverse direction, the container is conveyed on the support portions 2 and lowered at that location by retracting the lifting mechanism of the vehicle. The vehicle then moves away from this region.

For positive-locking connection, the modules 111 each have a groove 5 so that two adjacent modules can be orientated and connected by means of a wedge which is introduced into the two grooves 5 which open into each other.

Preferably, the groove 5 has a dovetail-like cross-section.

At the upper side of one of the columns 1, which is preferably constructed as a double T-carrier, of the module 111, a plug type connector portion 6 is arranged and at the lower side of the column 1 a corresponding plug type mating

connector portion 7. Consequently, when a module 111 is placed on a first module 111, an electrical connection can also be produced so that the primary conductor 4 is supplied with alternating current.

The support portion 2 of the module 111 is constructed in each case so as to be suitable for jacking up a container.

The store has at one side regions which are formed with modules 111 so that containers can be stored. In another region, cooling containers can be stored, for which modified modules 111 are used and have a laterally arranged primary conductor portion 50, as shown in Figure 5. Consequently, it is possible to connect at the container a voltage supply unit which has a secondary winding which can be coupled to the primary conductor portion 50 in an inductive manner. The voltage supply unit converts the induced voltage into a conventional three-phase voltage so that the consumer can be electrically connected to the voltage supply unit and can be supplied with electrical power therefrom.

As shown in Figure 11, however, the store also has a lift region, modules according to Figure 4 being used for this purpose. The associated roof module is shown in Figure 7. As shown in Figure 4, each of these modules used in the lift region has a recess 43 through which a vehicle with a container can be moved. In the machine compartment 71 of the roof module, a lifting mechanism is arranged for this purpose. There are further arranged in the longitudinal direction a rolling door 41 and in the transverse direction a sliding door 42 so that a safety device is arranged between the travel region and the recess 43.

As shown in Figure 6, the module has four columns, one of which is provided with the plug type connector portion 6 and at least one groove 5 being provided at each side.

As shown in Figure 7, the machine compartment 71 is arranged on a base plate which can be used as a roof plate in the lift region.

In order to form the additional roof of the store, there are shown additional base plates (80, 90) which carry solar generators 81 or wind power generators 91, whereby a significant proportion of the electrical energy requirement can be produced in a regenerative manner. Since the bearing can advantageously be arranged in a harbour, a high wind yield can also be achieved, even at night.

It is further also possible to provide on the roof modules with water tanks so that solar energy can be stored at that location. Other storage technologies can also be provided in a module which is arranged on the roof, a uniform supply of the store with electrical power thereby being enabled. In this manner, the store can be connected to the public power supply network with the lowest possible connection power.

Within the store, it is also possible to construct travel paths with relatively large free spaces using modules which are constructed in accordance with Figure 10. These have only a base plate 100 having a primary conductor 104 and columns 101, in particular with one of the columns being constructed with a plug type connector portion and plug type mating connector portion so that the primary conductor 104 can again also be supplied with electrical power. As with the modules 111, the current can then be directed from one end of the

column to the other end of the column and the entire store is consequently electrified.

As shown in Figure 11, the bearing has not only regions for storing containers in modules 111 and lift regions but also unloading regions 112. The modules 11 are stacked one above the other at that location, but not all at the same height, in particular therefore on the same floor.

The store thus has different heights in the unloading regions 112 which are available for the crane. Preferably, one unloading region 112 is provided for each floor of the store. In Figure 11, an unloading region 112 is provided on the 9th floor, on the 6th floor and on the 3rd floor.

In a state perpendicular to the direction of section of Figure 11, there are further provided unloading regions 112 of different heights. In particular in a perpendicular direction relative to the 9th floor, an unloading region 112 is provided on the 8th floor and on the 7th floor. There is also provided, in the perpendicular direction with respect to the direction of section with respect to the unloading region 112 shown in Figure 11, an unloading region on the 6th floor and on the 5th floor. The lowest three floors are arranged so as to be recessed in the ground and can consequently be provided with containers only via the lift region.

At the side of the unloading regions 112 facing away from the other region of the store, there is arranged a crane or a lifting mechanism which removes the containers from a ship and is capable of placing them on the unloading regions 112. A container can also be received from the unloading region and transported onto a ship.

The store can therefore be used as an intermediate store for containers.

In the outermost row of modules 111 of the store, that is to say, in the row next to the ship, a first unloading region is provided on the third floor, another unloading region on the 4th floor and yet another on the 5th floor. The floor sequence is thus 3, 4, 5.

The nth floor is intended to mean in this instance that, below the module 111, that is to say, in the spatial region of the perpendicular projection of the module 111 as far as the floor, a total of n-1 modules 111 are arranged in a stacked manner.

In the next parallel row of the store, the floor sequence is 6, 7, 8. In the next parallel row of the store relative thereto, the floor sequence is 9, 10, 11.

In this manner, all the floors are provided in the entire unloading region with the exception of the underground floors, that is to say, with the exception of the 1st and 2nd floors.

Consequently, a container can be unloaded on one of the floors, with a vehicle being arranged in the corresponding unloading region 112 in this instance and receiving the container, preferably with a deployed lifting mechanism. Afterwards, the vehicle moves the container to the module 111 provided for it and places it on the corresponding support portions 2 of the module 111. Alternatively, it moves the container to the modified module so that a cooling unit of the modified module can be supplied with electrical power.

Depending on the optimisation of a central control unit, the use of the lift for travel is also possible.

The vehicle has a track guide or a navigation system.

In another embodiment according to the invention, the lifting mechanism of the vehicle is driven by a regenerative drive so that energy can be recovered when the lifting mechanism is retracted.

As shown in Figure 12, in another store system an onward transport of containers 121 can be carried out by means of a transport ship 120. The unloading or loading of the ship 120 is enabled by means of the container crane 122 with which the unloading regions 112 of different heights can again be loaded or unloaded.

At the side facing away from the ship 120, another container crane 123 is arranged and removes the containers 121 from a receiving region 124 which is also stepped or unloads them at that location.

List of reference numerals

- 1 Column, in particular double T-carrier
- 2 Support portion
- 3 Base plate with travel face
- 4 Primary conductor
- 5 Groove
- 6 Plug type connector portion
- 7 Plug type mating connector portion
- 40 Base plate
- 41 Rolling door
- 42 Sliding door
- 43 Recess for lift
- 50 Primary conductor portion for inductive power supply of cooling container
- 70 Base plate
- 71 Machine compartment, in particular lifting mechanism drive for lift
- 80 Base plate
- 81 Solar generator
- 90 Base plate
- 91 Wind power generator
- 100 Base plate
- 101 Column
- 104 Primary conductor
- 110 Module for lift region
- 111 Module
- 112 Unloading region
- 120 Transport ship
- 121 Container
- 122 Container crane
- 123 Container crane
- 124 Receiving region

Claims

1. Store, in particular a store arrangement, in particular a store for containers,
5 wherein the store has identical modules which are arranged so as to be stacked one on the other, each of the modules having a base plate, the base plate having a travel surface that allows a vehicle to be moved on the travel surface,
10 wherein a maximum of n modules are arranged so as to be stacked one above the other, in particular therefore the store has n floors which are formed by modules,
 wherein the store has unloading regions which comprise less than n modules which are stacked one above the other,
15 in particular therefore have a height, in particular a floor height, of less than n modules which are stacked one above the other,
 wherein n is a whole number greater than 1, and
 wherein each of the unloading regions is associated
20 with one of the n floors to enable storage or removal of the containers.
2. Store according to claim 1, characterised in that
 the store can be extended in a vertical direction and
25 in all horizontal directions by adding and connecting additional modules.
3. Store according to at least one of the preceding claims, characterised in that
30 the quantity of floor heights of the unloading regions of the store has the whole numbers from $n_{\min}$ to $n-1$ or to n,

- 17 -

in particular wherein the floor height, in particular stack height, corresponds to the number of modules which are stacked one above the other in each case,

in particular wherein $n_{\min}$ is a whole number which is
5 smaller than n , in particular wherein $n_{\min}$ corresponds to the floor height which is arranged in a recessed manner in the floor.

4. Store according to at least one of the preceding
10 claims, characterised in that

the respective floor height of the unloading regions decreases in a monotonous manner from an unloading region of maximum height as the distance increases, in particular in a horizontal direction,

15 in particular in a horizontal longitudinal direction and in a horizontal transverse direction.

5. Store according to at least one of the preceding claims, characterised in that

20 the respective module, in particular the uppermost of the modules which are stacked one above the other, is open in an upward direction, in particular therefore can be filled from the top with a container, in particular which can be deposited in this instance on a support portion.

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6. Store according to at least one of the preceding claims, characterised in that

the module in each case has columns which are secured to the base plate and which in particular are each of the
30 same length, in particular double T-carriers, in particular with an additional module being able to be placed on the columns.

- 18 -

7. Store according to claim 6 when dependent on claim 5, characterised in that

the container which is stored on the support portion is spaced apart from the base plate in such a manner that
5 the vehicle can be driven at least partially below the container,

in particular wherein the vehicle has a lifting mechanism by means of which the container is arranged so as to be raised from the support portion when the lifting
10 mechanism is deployed.

8. Store according to claim 7, characterised in that

the vehicle together with the container received on the lifting mechanism of the vehicle can be moved on the
15 base plate of the module in a horizontal longitudinal direction and/or transverse direction through the module.

9. Store according to at least one of claims 7 and 8, characterised in that

20 a primary conductor for inductive power supply of the vehicle is arranged in the base plate,

in particular wherein the vehicle has at the lower side thereof a secondary winding which can be coupled to the primary conductor in an inductive manner so that energy
25 can be transmitted,

in particular wherein a capacitor is connected in series or in parallel to the secondary winding in such a manner that the associated resonance frequency substantially corresponds to the frequency of the
30 alternating current which has been impressed into the primary conductor.

10. Store according to claim 9, characterised in that

- 19 -

the module has a primary conductor portion which is spaced apart from the base plate for inductive power supply of a consumer, in particular a cooling unit, of a container,

5 in particular wherein the container has at the side thereof a secondary coil which can be coupled in an inductive manner to the primary conductor portion so that energy can be transmitted,

10 in particular wherein a capacitor is connected in series or in parallel to the secondary coil in such a manner that the associated resonance frequency substantially corresponds to the frequency of the alternating current which has been impressed into the primary conductor,

15 in particular wherein the secondary coil current of a voltage adapter unit is supplied in order to supply the consumer with electrical power.

11. Store according to at least one of the preceding
20 claims, characterised in that

there is arranged at the upper end region of the module, in particular at the upper end region of a column, a plug type connector portion and, at the lower end region of the module, in particular at the lower end region of a
25 column, a corresponding plug type mating connector portion,

in particular in such a manner that, when the modules are stacked one on the other, the plug type mating connector portion is connected in a plugged manner in the plug type connector portion.

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12. Store according to at least one of the preceding claims, characterised in that

- 20 -

two adjacent modules are connected to each other in a positive-locking manner in each case, in particular there is arranged at a respective side of the module a groove, in particular a groove which is formed in a dovetail-like manner, so that a wedge can be introduced into two grooves which are adjacent to each other.

13. Store according to at least one of claims 9 and 10 and claims 11 and 12 when dependent on claim 9 or 10, characterised in that

the primary conductor comprises in the base plate portions which extend in the longitudinal direction and transverse direction.

14. Store according to at least one of claims 6 to 10 and 13 and claims 11 and 12 when dependent on claim 9 or 10, characterised in that

a respective support portion is arranged on the base plate.

15. Store according to at least one of the preceding claims, characterised in that

the store has a covering plate which has a machine compartment, an energy store, a wind generator and/or a solar generator,

in particular wherein the energy store has an accumulator or a water tank,

in particular wherein a thermo element, a thermoelectric converter, a Peltier element, a generator which is driven by a Stirling motor and/or a water power generator are provided in order to obtain electrical energy from the water tank,

- 21 -

in particular wherein solar thermal converters supply heated water to the water tank in the event of solar irradiation.

- 5 16. Store according to at least one of the preceding claims, characterised in that

the store has in a lift region an additional module which has in a base plate thereof a recess which is so large that a container can be moved through the recess by
10 means of a lifting mechanism,

in particular wherein the module has one or more door elements, in particular a rolling door and/or a sliding door.