

Method and apparatus for storing and retrieving or shifting
containers in high-bay warehouses

The invention relates to a method and apparatus for storing and retrieving or shifting containers in high-bay warehouses or stores of a transfer facility, more particularly a sea port or an inland port, wherein the containers are transported as well as stored and retrieved and shifted by storage and retrieval units which can be displaced in aisles extending in parallel to compartments of the high-bay warehouse which are on a number of levels in storage units.

Known through EP 1 272 414 B1 is a transfer facility at a sea port and inland port for, in particular, standard containers such as 20 TEU or 40 TEU containers, with a container store of individual row-like storage modules provided along a quay and with at least one loading apparatus interacting with the storage modules for transferring cargoes from and to a ship moored at the quay. The loading apparatus for transferring cargoes is equipped with at least one mobile port crane. Its cargo jib extends to the transfer area of the least one container store comprising a number storage modules provided with container rows dependent on the module width, forming an interface between the port mobile crane and the storage modules of the container store.

A container placed on the transfer area by the pivoting jib of the mobile port crane is grasped by a stacking crane which carries out the horizontal transportation and stacking of the containers. The stacking crane is designed as an upright gantry crane with crane trolley and spans a storage module, for example nine containers wide and three to four containers high, of the container store extending at right angles to the quay. The storage modules are interlinked by at least two independently acting lateral

transporters moving in different horizontal planes perpendicular to the individual storage modules. The containers are stacked on top of each other in the compartments of the storage modules of the container store, which prevents effective storage and retrieval.

From DE 10 2008 007 860 A1 it is known to store and retrieve any number of containers on top of or next to each other individually in compartments, thereby making shifting of the containers in any sequence possible. For this, in view of the limited area available in port terminals, and to avoid their expansion, portal cranes are used which allow more closely spaced storage of the containers than in the aisles used by floor-going stackers or storage and retrieval units. The containers are arranged with a slight space on top of each other and individually accessible in the compartments, which in the direction of the interior of the compartment are equipped with rails on both sides corresponding to the width of the container place with their front end in the compartment. The gantry crane that can be displaced over the aisles carries a container holder, which can be raised and lowered by cables, which is arranged on a transfer bridge equipped with rails and at its ends has motor or hydraulically height-adjustable container grips which can be locked on suspension points of the containers at the corners, wherein the containers can be placed on transverse spars arranged in the compartment and/or picked up from them. For the storage and retrieving of containers, the container holders are travelled over on alternate sides over driven rollers on the tracks of the compartments in their longitudinal direction over the entire compartment depth. For adaptation to the different container lengths the container holder has length-adjustable transverse spars on which the container grips are provided.

The aim of the invention to provide a method and a device with which in high-bay stores of this type transport use can be reduced and access to every individual container can also be achieved with floor-going stackers in a narrowly structure high-bay store.

This task is solved in accordance with the invention through a method which is characterised in that through raisable and lowerable telescopic holders of the storage and retrieval unit the containers, with their longitudinal sides in front are preferably telescopically stored in the compartments without projecting beyond the peripheral outer contour or removed from them and telescopically moved back into the transporting position in the storage and retrieval unit. During this the container are preferably brought suspended by the extended telescopic holders, out of the contour of the storage and retrieval devices, into the compartments and advantageously only placed there supported on their corner points. On retrieval from the compartment the containers are again preferably suspended and through retraction of the telescopic holders brought into their retracted initial position in the transporting position flush with the contour of the storage and retrieval unit, i.e. with their narrow ends sides pointing in the direction of the aisles.

A great advantage of this method of storing and retrieving containers is that longitudinal side storing and retrieval in interaction with the extension and retraction of the telescopic holders with the containers suspended thereon in bursts, allows an extremely space saving design of the high-bay store with the smallest possible width dimensions of the aisles. These only have to be slightly wider than the width of the container in order through sufficient lateral intermediate space to ensure travelling past the storage modules with the compartments. The storage and retrieval units can therefore be compact and require no

additional space-occupying projecting jib or gripper arm for storing and or retrieving or stacking or shifting. The broadest contour of the storage and retrieval unit largely corresponds to the container width without an overhang. Right from the start of the handling movement the when telescoping the telescopic holders enter into the compartment with the container with increasing horizontal displacement until the final storage position is reached.

Advantageously the method is characterised in such a way through a storage process that

- at the introduction end of the high-bay store the containers are made available with their longitudinal axis extending in parallel to the high-bay store on a side next to the aisles
- subsequently a storage and retrieval device which is displaceable in the aisle is moved to in front of the container to be retrieved and picks up the locked container via its suspension point, for which, through a handling movement orthogonal to the aisle, telescoping holders equipped with locking means are extended out of the storage and retrieval unit up to above the container suspension point and lowered for locking,
- after locking, the telescopic holders with the suspended containers are raised and through an opposite handling movement are retracted into the storage and retrieval unit until the container assumes a suspended position or transporting position in the compartment in a plane flush with the aisle.
- subsequently the storage and retrieval unit is displaced in the aisle to a compartment to be filled and the telescopic holders, which are preferably

arranged on a lifting bridge, are raised vertically if the compartment is at a higher level,

- the container pre-positioned in this way is introduced into the compartment by a handling movement of the telescopic holder orthogonally the aisle,
- the container is then placed with its container corner area on the corner supports arranged on the vertical posts of the storage module defining the compartments and
- after releasing the container the telescopic holders are raised and moved back into their retracted initial position.

During the retrieval or shifting of a container e.g. changing the storage position within a storage module or into a different aisle, e.g. in order to improve throughput, wherein the telescopic holders are moved out of the storage and retrieval unit into their holding position in the compartment, the fully automatically handling and travel as well as locking movements are the reverse of the storage procedure described above.

A device according to the invention, more particularly for implementing the method envisages that the high-bay store for the longitudinal side storage of containers consist of any number of storage units of a depth corresponding to a container width, on multiple levels several compartments high, which are consecutively arranged in rows in the longitudinal direction along one aisle side and are each separated in the transverse direction by one aisle, and has storage and retrieval units which can be moved back and forth in the aisles and are designed with telescopic holders which can be extended or retracted orthogonally to the aisle and can be raised and lowered for holding a

container. The containers intended for storing in the compartment of the storage modules are provided by transporting vehicles and/or intermediate transfer means, e.g. slides, which after depositing of the containers by the transport vehicle, moves them to the access area of the storage and retrieval unit, at a front side of the high-bay storage next to the aisles where they are taken up by the storage and retrieval devices and transported to a compartment with their narrow end sides facing in the direction of the aisle.

Containers intended for retrieval from a compartment are moved by the storage and retrieval unit with their longitudinal sides in front horizontally from the compartment into the contour of the storage and retrieval unit and are then transported with their narrow end side facing in the direction of the aisle directly to the end side of the high-bay store opposite the storage end side and are made ready for transporting away. It should be noted here that the material flow has all degrees of freedom and that a static allocation of the end sides is not stipulated, so that storing and retrieving procedures can take place from both end sides of the high-bay store.

The containers which during storing are moved horizontally with their longitudinal sides in front out of the contour of the storage and retrieval unit into the compartment, are there placed, by means of a lifting movement of the storage and retrieval unit, with their base corner sections on corner supports provided therefore in the compartments.

With the storage and retrieval units, which preferably can enter the aisles from both end sides of the high-bay store, any kind of access to every single container stored in the containers of the multiple-level storage modules is possible.

In one embodiment of the invention, the floor/aisle-bound storage and retrieval unit comprises a frame, comprising vertical supports and head or foot spars connecting them to each other, which is of a height corresponding to the multiple-level high-bay store.

For moving the storage and retrieval device a drive is advantageously integrated into the foot spars and is implemented by way of a wheel/rail connection usual in storage and retrieval units.

A preferred embodiment of the invention envisages that a hoisting device runs in guides of the vertical supports and comprises side supports consisting of spaced, parallel longitudinal spars opening upwards in a forked or y-shaped manner and these on both opposite fork ends connect with each other to form a frame, wherein to reinforce the hoisting device parallel struts are provided under the longitudinal spars which each extend from one foot end of one side support to the foot end of the other side support. The hoisting device formed in this way, which due to its structure combining the two side supports can also be called a hoisting bridge always remains in the axis of the storage and retrieval unit during all required handling movements.

In accordance with the invention, for raising/lowering the hoisting device/hoisting bridge, a cable control device, comprising a cable, a cable drum, pulleys, a hoist motor and hoist gears is provided, via which the hoisting device/hoisting bridge can be exactly horizontally positioned in relation to a compartment at any level within the storage and retrieval unit.

The length of the hoisting device/hoisting bridge for picking up a container is designed in accordance with the largest occurring container length and the symmetrical

width of the fork or y-shaped side supports in accordance with the standard container width, so that the largest outer contour of the hoisting device/hoisting bridge can be the same as the outer contour of the containers. Accordingly the high-bay store can have storage locations for containers of different lengths and heights which are transported and manoeuvred by the storage and retrieval units. The containers are, for example, standard containers corresponding to DIN-ISO-668 dimensions and ISO-6346 types.

A further embodiment of the invention envisages that arranged at a distance from one another on the longitudinal spars of the hoisting device/hoisting bridge are two further stationary telescopic holders the free distance between them bridging the smallest container length and, two further stationary telescopic holders at a distance corresponding to the largest container length.

For storing or retrieving a standardised 20-foot container TEU (twenty-foot equivalent unit) the two inner telescopic holders with the smallest distance between them are used, whereas for storing and retrieving a standardised 40-foot container FEU (forty-foot equivalent unit) the two outer telescopic holders with the greatest distance between them are used. The stationary telescopic unit are fastened with their basic housing to the underside of the longitudinal spars, wherein the two inner telescopic holders are arranged offset in height with regard to the outer telescopic holders.

In accordance with a preferred embodiment of the invention it is envisaged that on inner sides of the longitudinal spars facing each other linear guides are arranged in which two telescopic holders can be moved and through a movement can be positioned towards or away from each other in accordance with the length of the container in question. In this way, with only two telescopic holders both 20-foot

containers and also 40-foot containers or containers with other dimensions can be stored and retrieved or shifted, for which, in accordance with one proposal of the invention, the displaceable telescopic holders roll along the linear guides in the longitudinal spars on rollers arranged upright in holding or support blocks on their basis housings.

In accordance with the invention it is also envisaged that for each linear guide, two double roller arrangements are provided on each of the sides of the basis housing of the telescopic holders. The thus resulting in total eight roller holder allows secure and warp-free movement of the telescopic holders within the linear guides.

One advantageous embodiment of the invention envisages that both the basic housing of the stationary telescopic holders and also the basic housing of the displaceable telescopic holders accommodates two extendable and retractable telescopic pusher arms, wherein an outer telescopic pusher arm runs with bilateral outer guide profiles on rollers of the basic housing and an inner telescopic pusher arm runs with bilaterally arranged rollers in inner guide profiles of the outer telescopic pusher arm.

The telescopic pusher arms are integrated in the basic housing in this way and are preferably displaceable by way of rack and pinion gearing, allow the telescopic holders to be designed in a compact manner, so that neither the main housing nor the telescopic pushing arms when fully retracted in the basic setting project beyond the width of the hoisting device/hoisting bridge.

Additionally, seen in the direction of the longitudinal storage of the containers, the telescopic arms have front locking means arranged on the inner telescopic pushing arm, and rear locking means arranged on the outer telescopic

pushing arm. The locking means consist of so-called twistlock bots, which are standardised and engage in complementary openings on the upper side of the container.

It can also be envisaged that on the narrow side of a vertical support of the storage and retrieval unit a stage structure, attached to the vertical support and the foot spar, is arranged for accommodating supply means for the hoisting device, the drive of the storage and retrieval unit and the displaceable telescopic holders. The stage structure serves as a platform for, for example, switch and electrical boxes, cable drums, hoist motor and hoist gears as well as brakes and braking resistors, wherein the width of the stage structure is approximately identical to the width of the hoist device and the storage and retrieval unit.

Further features and details of the invention are set out in the claims and following description of examples of embodiment of the invention shown in the drawing. In these

Fig. 1 shows a perspective, simplified overall view of a multiple level high-bay store with floor-based storage and retrieval units which are displaceable in the aisles;

Fig. 2 shows a perspective overall view of a storage and retrieval unit as a detail,

Fig. 3 shows, as a detail of the high-bay store in fig. 1, a perspective partial view of a storage and retrieval unit, standing in front of a compartment of a storage module with telescopic holders for storing a container extended into the compartment,

- Fig. 4 shows, as a detail of the storage and retrieval unit in fig. 3, a perspective partial view of its hoisting bridge with a container suspended on the extended telescopic holders,
- Fig. 5 shows, as a detail as previously in fig. 4 and 5, the hoisting bridge of the storage and retrieval unit with in this case, compared with fig. 4, a container with smaller longitudinal dimension suspended and locked by the telescopic holders, for which the telescopic holders have been moved towards each other in linear guide of the longitudinal spars of the hoisting bridge,
- Fig. 6 shows a perspective view as previously in fig. 4 and 5 of a hoisting bridge, with telescopic holders fastened in a stationary manner on longitudinal spars of the hoisting bridge with the longitudinal dimension corresponding to the smallest container and the largest container, which from the start are arranged so that they can be locked on suspension points of the container,
- Fig. 7 shows, as a detail, a perspective overall view of a telescopic holder in the initial position with retracted telescopic pusher arms, and
- Fig. 8 shows the telescopic holder of fig. 7 with extended telescopic pusher arms.

Schematically, fig.1 shows a high-bay store 1 comprising storage modules 2 of compartments 3, arranged in rows at multiple levels for storing and retrieving containers 4, wherein the compartments 3 have corner supports 5 for receiving the container 4 (cf. fig. 3).

Between the storage module 2 are aisles 6 extending over the entire length of the high-bay store 1 along which storage and retrieval units 7 can move back and forth, wherein the storage and retrieval units 7 can enter the aisle 6 from both end sides 8, 9 of the high-bay store 1.

At the front end side 8 - and/or optionally the rear end side - of the high-bay store 1 the containers 4 are provided by transporting vehicles 10 and possibly intermediate transfer means (not shown) at a side next to the aisle 6 with their longitudinal axis extending in parallel to the high-bay store. There the containers 4 are taken up in a suspended position by the storage and retrieval units 7 and transported along the aisles 6 to a compartment 3 of a storage module 2 into which they are placed with their longitudinal side 11 in front. In divergence from the example of embodiment and in dependence on the actual integration of the high-bay store in a container terminal, storage and retrieval points, for example, can be located on the longitudinal sides of the high-bay store.

A container 4 retrieved from a compartment 3 by means of the storage and retrieval unit 7 for removal from the store is transported via the aisle 6 to the rear end side 9 of the high-bay store 1 and deposited therefore for onward transportation.

The storage and retrieval unit 7 shown as a detail in fig. 2 has a frame 15 which comprises vertical supports 12 and, connecting these, head and foot spars 13, 14 and which corresponds in height to a multiple level storage modules 2.

The storage and retrieval unit 7 can be displaced via rack and pinion gearing 16, wherein a drive toothed wheel 17 is integrated into end section 18 of the foot spar 14 and the

rack 19 in which it engages is arranged in the base 20 of the aisle 6 as is indicated in fig. 3.

The vertical supports 12 are designed with guides 21 in which a hoisting bridge 22 of a hoisting device 23 which consists of lateral supports 24 widening out upwards in a forked manner and, connecting these at two opposite fork ends 25, 26 to form a frame, spaced longitudinal spars 27, 28 extending in parallel to each other. To reinforce the hoisting device 23, at the lower end of the lateral support 24 and bridging this, spaced parallel foot spars 29, 30 are provided (cf. fig. 4, 5 and 6).

For raising and lowering the hoisting bridge 22 in accordance with double arrow 31 a cable control device is provided, of which only the cable drum 32 and the pulleys 33 arranged on the head spar 13 of storage and retrieval device 7 are shown.

The length of the hoisting bridge 22/the hoisting device 23 is designed for receiving the container 4 which has the largest occurring container length of, for example, 40 FEU (forty-foot equivalent unit). However, containers 34 which have the smallest occurring container length of, for example, 20 TEU (twenty-foot equivalent unit) should also be able to be held and transported by the hoisting device 23 (cf. fig. 5 and 6).

As shown in fig. 6, provided on the longitudinal spars 27 and 28 of the hoisting bridge, are two inner stationary telescopic holders 35, 36 for holding the shorter container 34, and two outer telescopic holders 37, 38 arranged further apart from one another for holding the longer container. The stationary telescopic holders 35 to 38 are fastened with their basic housings 39 to the undersides of the longitudinal spars 27 and 28, with the inner ones offset in height in relation to the outer ones.

In accordance with a further embodiment shown in fig. 5, only two telescopic holders 40, 41 are provided, which can be displaced in linear guides 42 of the longitudinal spars 27 and 28 and can thus be positioned through a movement towards or away from each other - double arrow 43 - corresponding to the length of the container 34 or the container 4 (cf. figs. 2, 3 and 4). The displaceable telescopic holders 40, 41 are held in the linear guides 42 of the longitudinal spars 27 and 28 via double rollers 46 arranged on their basic housing 44 on carriers or supports 45 (see fig. 7).

Both the basic housing 39 of the stationary telescopic holders 35 to 38 and also the basic housing of the displaceable telescopic holders 40, 41 accommodates an outer telescopic pusher arm 47 and an inner telescopic pusher arm 48, wherein the outer telescopic pusher arm 47 runs with bilateral outer guide profiles 49 on rollers 50 of the basic housing 39 and 44, and the inner telescopic pusher arm 48 with bilaterally arranged rollers 51 in inner guide profiles 52 of the outer telescopic pusher arm 47 (cf. fig. 7 and 8).

The extension and retraction of the outer and the inner telescopic pusher arms 47, 48 takes place via rack and pinion gearing 53, 54. In the rack and pinion gearing 53 for the outer telescopic pusher arm 47 a rack 55 is provided between the outer guide profiles 49, while a pinion 56 engaging in the rack 55 is arranged on the upper side of the basic housing 39 and 44. In the case of the rack and pinion gearing 54 for the inner telescopic pusher arm 48 a rack 57 is provided on the telescopic pusher arm 48 itself, whereas the pinion 58 engaging in the rack 57 is arranged between the outer guide profiles 49 of the outer telescopic pusher arm 47.

For locking to the containers 4, 34 the telescopic pusher arms 47, 48 are each fitted with so-called twistlock bolts 59, 60 on their underside.

The storage and retrieval unit 7 is also designed with a stage structure 61 arranged on the end section 18 of the foot spar 14. The stage structure 61 accommodates the equipment required for the drive 16 of the storage and retrieval unit 7 and for controlling the telescopic holders 35 to 38 and 40, 41.

By way of fig. 1 to fig. 4 the procedure for storing a container 4 in the high-bay store 1 is described below.

With the outer and inner telescopic pusher arms 47, 48 fully retracted, the storage and retrieval unit 7 is moved by way of its rack and pinion gearing 16 in the aisle 6 to the front end side 8 of the high-bay store 1 in order to there pick up a container 4 provided at a side next to the aisle 6 with its longitudinal axis extending in parallel to the high-bay store 1. For this the telescopic holders 40, 41 are displaced via their double rollers 46 in the linear guides 42 in accordance with the length of the container 4 to be picked up and the outer and inner telescopic pusher arms 47, 48 are extended via their rack and pinion gearing 53, 54 over the container and lowered to over the container's suspension point. Through the front and rear twistlock bolts 59, 60 the container is now locked to the outer and inner telescopic pusher arm 47, 48.

After locking, the outer and inner telescopic pusher arms 47, 48 with the attached container 4 are lifted by the hoisting bridge 22 and via the rack and pinion gearing 53, 54 retracted into the storage and retrieval unit 7 or under the hoisting bridge 22 unit the container 4 assumes a suspended or transporting position in the storage and

retrieval unit 7 that is flush with the plane of the aisle 6.

Via its rack and pinion gearing 16 the storage and retrieval device 7 is displaced in the aisle 6 to a compartment 3 to be occupied in a storage module 2 and the hoisting bridge 22 with the suspended container 4 is positioned for the horizontal, telescopic handling procedure. The container 4 can now through extension of the outer and inner telescopic pusher arms 47, 48 be telescoped with its longitudinal side 11 in front into the compartment 3 and placed there through lowering the hoisting bridge 22 on to the corner supports 5.

After loosening the locking of the container 4 through unlocking the twistlock bolts 59, 60, the outer and inner telescopic pusher arms 47, 48 are raised and via the rack and pinion gearing 53, 54 are moved into their retracted initial position under the hoisting bridge 22 so that the storage and retrieval unit 7 is ready for a new storage and/or retrieval procedure.

On retrieving a container 4, 34 from a compartment 3 of a storage module 2 by means of the storage and retrieval unit 7, wherein the containers 4, 34 is then taken to the rear end section 9 of the high-bay store 1, the fully automatically controlled drive, hoisting and telescoping and locking movements are the reverse of the storing procedure described above.

List of symbols

1	High-bay store
2	Storage module
3	Compartment
4	Container (40 FEU)
5	Corner support
6	Aisle
7	Storage and retrieval unit
8	Front end section
9	Rear end section
10	Transport vehicle
11	Longitudinal side
12	Vertical support
13	Head spar
14	Foot spar
15	Frame
16	Rack and pinion gearing
17	Toothed wheel
18	End section
19	Rack
20	Base
21	Guide
22	Hoisting bridge
23	Hoisting device
24	Lateral support
25	Fork end
26	Fork end
27	Longitudinal spar
28	Longitudinal spar
29	Foot strut
30	Foot strut
31	Double arrow
32	Cable drum
33	Pulley
34	Container (20 TEU)
35	Telescopic holder

36	Telescopic holder
37	Telescopic holder
38	Telescopic holder
39	Basic housing
40	Telescopic holder
41	Telescopic holder
42	Linear guide
43	Double arrow
44	Basic housing
45	Carrier/support
46	Double roller
47	Outer telescopic pusher arm
48	Inner telescopic pusher arm
49	Outer guide profile
50	Roller
51	Roller
52	Inner guide profile
53	Rack gearing
54	Rack gearing
55	Rack
56	Pinion
57	Rack
58	Pinion
59	Twistlock bolt
60	Twistlock bolt
61	Stage structure

Claims

1. Method for storing and retrieving or shifting containers (4, 34) in high-bay stores (1) of a transfer facility, in particular a sea port or inland port, wherein the containers (4, 34) are transported as well as stored, retrieved or shifted by storage and retrieval units (7) which can be displaced in aisles (6) extending in parallel to compartments (3), arranged in multiple levels of storage units (2) of the high-bay store (1)

characterised in that by way of raisable and lowerable telescopic holders (35 to 38; 40, 41) of the storage and retrieval unit (7), the containers (4; 34), with their longitudinal side (11) in front, are telescopically stored in the compartment (3) from a transporting position which preferably does not project beyond the peripheral outer contour of the store and retrieval unit (7), or are removed therefrom and telescoped back into the transport position in the storage and retrieval unit (7)

2. Method according to claim 1

characterised in that

the containers (4, 34) are suspended from the telescopic holders (35 to 38; 40, 41) for storing and/or retrieving.

3. Method according to claim 1 or 2

characterised in that

the containers (4, 34) are stored in the compartments (3) only supported at their corner points.

4. Method according to any one of claims 1 to 3

characterised by a storing procedure such that

- at the entrance end (8) of the high-bay store (1) the containers (4, 34) are provided with their longitudinal axis extending parallel to the high-bay store (1) on a side next to the aisles (6),
- a storage and retrieval unit (7) which can be displaced in the aisle (6) is moved to in front of the container (4, 34) and then picks up a container (4, 34) locked to its suspension points in a suspended position, for which through a handling movement orthogonal to the aisle (6), telescopic holders (35 to 38; 40, 41) equipped with locking means (59, 60) are extended from the storage and retrieval unit (7) to above the container suspension point and lowered onto these,
- after locking, the telescopic holders (35 to 38; 40, 41) with the suspended container (4, 34) are raised and via an inverse handling movement are retracted back into the storage and retrieval unit (7) until the container (4, 34) assumes a suspended position or transporting position in the storage and retrieval unit (7) flush with the plane of the aisle (6),
- the storage and retrieval unit (7) is then displaced in the aisle (6) to in front of a compartment (3) to be occupied, and the telescopic holders (35 to 38; 40, 41), which are

preferably arranged on a hoisting bridge (22), are raised vertically if the compartment (3) is on a higher level,

- the container (4, 34) pre-positioned in this way is brought into the compartment (3) through a handling movement of the telescopic holders (35 to 38; 40, 41) orthogonal to the aisle (6),
 - the container (4, 34) is then placed with its container corners on the corner supports (5) arranged on vertical posts of the storage module (2) delimiting the compartments (3) and
 - after unlocking of the container (4, 34) the telescopic holders (35 to 38; 40, 41) are raised and moved into their retracted initial position.
5. Device for storing and retrieving of shifting containers (4, 34) in high-bay stores (1) of a transfer facility, in particular a sea port or inland port, wherein the containers (4, 34) are transported as well as stored, retrieved or shifted by storage and retrieval units (7) which can be displaced in aisles (6) extending in parallel to compartments (3), arranged in multiple levels of storage units (2) of the high-bay store (1)

characterised in that

that the high-bay store (1) for the longitudinal side storage of containers (4, 34) comprises of any number of storage units (2) of a depth corresponding to a container width, on multiple levels several compartments (3) high, which are consecutively arranged in rows in the longitudinal direction along one aisle side and are each separated in the

transverse direction by one aisle (6), and has storage and retrieval units (7) which can move back forth in the aisles (6) and are designed with raisable and lowerable telescopic holders (35 to 38; 40, 41) which can be extended and retracted orthogonally to the aisle (6) for holding a container (4, 34).

6. Device according to claim 5

characterised in that

the floor-going storage and retrieval device (7) has a frame (15) which comprises vertical supports (12) connected by head and foot spars (13, 14) and is of a height corresponding to the multiple level high-bay store (1).

7. Device according to claim 5 or 6

characterised in that

integrated into the floor spar (14) is drive device (16) for the moving the storage and retrieval unit (7) along the floor.

8. Device according to any one of claims 5 to 7

characterised in that

running in guides (21) of the vertical supports (12) is a hoisting device (23) which consists of lateral supports widening out upwards in a fork or y-shape (24) with spaced longitudinal spars (27, 28) extending in parallel and connecting the opposite fork ends (25, 26) to form a frame, wherein for reinforcing the hoisting device (23) below the longitudinal spars (27, 28), spaced, parallel struts (29, 30) are provided

which in each case extend from the foot end of one lateral support (24) to the foot end of the other lateral support (24).

9. Device according to any one of claims 5 to 8

characterised in that raising and/or lowering of the hoisting device (23) takes place via a cable control device comprising a cable, a cable drum (32), pulleys (33) a hoist motor and hoist gears.

10. Device according to any one of claims 5 to 9

characterised in that

the length of hoisting device (23) holding a container (4, 34) is designed in accordance with the largest available container length and the symmetrical width of the lateral supports in accordance with standardised container width, so that the larger outer contour of the hoist device (23) coincides with the outer contour of the containers (4, 34).

11. Device according to any one of claims 5 to 10,

characterised in that

arranged on the longitudinal spars (27, 28) of the hoisting device (23) bridging the free distance between them in accordance with the smallest container length are two stationary telescopic holders (35, 36) and two further stationary telescopic holders (37, 38) at a distance from each other corresponding to the largest container length.

12. Device according to any one of claims 5 to 11

characterised in that

the stationary telescopic holders (35 to 38) are fastened with their basic housing (39) to the undersides of the longitudinal spars (27, 28)

13. Device according to any one of claims 5 to 11,

characterised in that on the two facing inner sides of the longitudinal spars (27, 28) linear guides (42) are provided in which two telescopic holders (40, 41) can be displaced and through a movement towards or away from each other can be positioned in accordance with the length of the relevant container (4, 34).

14. Device according to claim 13

characterised in that

the displaceable telescopic holders (40, 41) roll in the linear guides (42) of the longitudinal spars (27, 28) with rollers arranged upright (46) in carrier/supports (45) on their basic housing (44).

15. Device according to claim 14

characterised in that

for each linear guide (42) two double rollers (46) are provided on the sides of the basic housing (44).

16. Device according to any one of claims 5 to 15

characterised in that

both the basic housing (39) of the stationary telescopic holders (35 to 38) as well as the basic housing (44) of the displaceable telescopic holders (40, 41) accommodates retractable and extendable telescopic pusher arms (47, 48), wherein an outer telescopic pusher arm (47) runs with bilateral outer guide profiles (49) on rollers (50) of the basic housing (39, 44) and an inner telescopic pusher arm (48) runs with laterally arranged roller (51) in inner guide profiles (52) of the outer telescopic pusher arm (47).

17. Device according to claim 16

characterised in that

for moving the telescopic pusher arms (47, 48) rack and pinion gearings (53, 54) are provided.

18. Device according to any one of claims 5 to 17

characterised in that

the telescopic pusher arms (47, 48), seen in the direction of the longitudinal storing of the container (4, 34) have a front locking means (59, 60) arranged on the inner telescopic pusher arm (48) and area locking means (59, 60) arranged on the outer telescopic pusher arm (47).