

PATENT SPECIFICATION

(11) 1 408 519

1/2 98 519

- (21) Application No. 44881/73 (22) Filed 25 Sept. 1973
 (31) Convention Application No. 2 261 287
 (32) Filed 15 Dec. 1972 in
 (33) Germany (DT)
 (44) Complete Specification published 1 Oct. 1975
 (51) INT CL³ B65G 63/00, 67/02, 1/06
 (52) Index at acceptance A4T 14A6



(54) STORAGE INSTALLATION

(7 1) W e , D E M A G
 AKTIENGESSELLSCHAFT, a German body
 corporate of 41 Duisburg, Wolfgang-Reuter-
 Platz, Germany, do hereby declare the
 invention, for which we pray that a patent
 may be granted to us, and the method by
 which it is to be performed, to be par-
 ticularly described in and by the following
 statement:—

10 This invention relates to a storage in-
 stallation.

15 In certain conventional bays, the ap-
 paratus for transporting loads to and from
 the bays includes a hook at the lower end of
 a cable of a winding device mounted outside
 the building, such as on a gable of the
 building. A door opens through the wall of
 the building into each bay to enable loads to
 be drawn into the bay, but the load cannot
 exceed a certain weight.

20 The purpose of this invention is to provide
 a storage installation having a plurality of
 superposed storage bays with a load trans-
 porting apparatus which permits even
 heavy loads to be conveyed without danger
 and with only moderate effort and outlay to
 the bays where they are to be deposited.

30 According to the invention there is
 provided a storage installation including a
 plurality of superposed storage bays and
 apparatus for transporting loads to and from
 the storage bays, said apparatus comprising
 a lifting device for raising and lowering a
 load support frame within a vertically ex-
 tending shaft which opens to the storage
 bays, the shaft being delimited on two
 opposite sides by a respective pair of
 running surfaces associated with each of the
 storage bays, the load support frame having
 running wheels which are movable from
 stowed positions disposed wholly within the
 confines of the shaft as delimited by the
 pairs of running surfaces, to working
 positions in which the wheels are engagable
 with the running surfaces of any selected
 bay, whereby the load support frame may be
 run out of the shaft into the selected bays.

The support frame suspended from the
 lifting apparatus is placed on the container

thereto and raised by the lifting apparatus to
 the level of the desired storage bay. In this
 position the wheels of the support frame are
 moved into their working positions and the
 frame is then lowered by the lifting ap-
 paratus until the wheels rest on the running
 surfaces, which may consist of rails. The
 support frame is then detached from the
 lifting apparatus and moved on its wheels
 along the running surfaces into the storage
 bay, where the frame deposits the load.
 Heavy parts and containers can thus be
 stored in multi-storey buildings, and goods
 can be raised to the desired sales storey in a
 department store without being first un-
 packed.

65 The lifting device may be connected to a
 guide frame which remains permanently
 within the shaft and is connectable to the
 support frame. The guide frame may have
 guide rollers which are rotatable about
 horizontal axes and run on vertical guide
 rails which, in the zone of the running
 surfaces for the wheels, have gaps for these
 latter. The provision of a guide frame is
 desirable in high storage installations, since
 it prevents the support frame from swinging
 to and fro. The support frame may be
 releasably connectable with the guide
 frame by the interengagement of headed
 bolts or pins in openended apertures. The
 guide frame may be suspended from the
 lifting device by cables and have a cable
 attachment point, such as a pulley, in the
 vicinity of each corner so that it cannot tilt
 out of alignment with the guide rails, when
 passing the gaps in these latter.

A preferred feature of the invention is
 that the wheels of the support frame are
 coupled to motors connected to a power
 supply via current collector lines or via
 looped cables.

Each of the wheels of the support frame
 may be mounted on an arm which is
 pivotable about a horizontal axis, parallel to
 the direction of travel of the wheel, whereby
 the wheel is movable between its stowed and
 working positions. To permit the vertical
 position of the support frame to be adjusted

relative to the wheel, the arm may be pivoted to a guide bar which is guided for movement vertically relative to the frame. The guide bar may be fitted with a nut receiving a screw threaded spindle by which the support frame is supported from the wheel via a spindle bracket. Each spindle is preferably driven by its own spindle motor, rotation of the spindles serve to raise or lower the support frame relative to the wheels and hence allows loads to be picked up or deposited.

Alternatively, each of the wheels may be mounted on a support which is guided for movement in the direction transversely of the support frame. The wheel support may be displaced by a motor to move the wheel between its stowed and working positions. In one arrangement, the wheel support is connected to an endless traction element, such as a chain, which is circulated by the motor. In others, the wheel support is displaced by a rack-and-pinion drive or a displacement spindle.

In both constructions mentioned the support frame may carry two trolleys provided with means for supporting the load and traversable relative to the frame. Each trolley may be displaced by a motor on the trolley having a sprocket engaging a rack, formed for example by a chain affixed by its ends to the support frame. The trolleys are positioned by their respective motors when a load is to be picked up so that they are at that distance from each other which enables them to take up the load without difficulty.

Each trolley may be provided with a lifting and lowering device for a support fitted with locking lugs engaging locking apertures of load containers, but in the case of the aforementioned support frame capable of being adjusted vertically relative to its wheels, the provision of such a device on each trolley is unnecessary.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a side view of a storage installation, partly in cross section;

Figures 2 to 11 show schematically a load transfer operation using one embodiment of support frame;

Figures 12 to 21 show a load transfer operation using another embodiment of support frame;

Figure 22 shows the end of a support frame and a guide frame, as seen from the side and on a larger scale;

Figure 23 is a plan view of the apparatus in Figure 22;

Figure 24 is a view in the direction of arrow A in Figure 22; and

Figure 25 is a section along the line B—B of Figure 22.

Figure 1 shows a storage installation

having superposed storage bays, each of which has a floor constituting a storage surface 1 serving to accommodate loads, e.g. containers 3. In front of the storage surfaces 1 are floor openings 2 which together define a shaft through which the loads 3 are lifted and lowered by a lifting apparatus 10 of which the supporting cables 8 pass over pulleys 9 to guide frame 15 connected via a support frame 12 with the load 3 in question. The pulleys 9 are supported on the building via brackets 11, the building being provided, above the storage surfaces 1, with supports 4 having running surfaces 5 in the form of rails for wheels 13 of the support frame 12. The guide frame 15 is guided on rails 6 which, above the support 4, have gaps 7 to give passage to the support frame 12.

In the example shown in Figure 2 the load container 3 is supported by locking lugs 45 forming parts of the support frame 12 and engaging locking apertures 44 in the said container. The said support frame 12 has two longitudinal members 12a, schematically indicated in the drawing, a vertical guide tube 28 being provided at each end thereof and serving for a guide bar 29 which is guided by means of rollers 30 and which is provided, at the lower end, with a shaft 25 for a pivot arm 24, with a wheel 13 mounted thereon. The pivot arm 24, suspended downwards with its wheel 13, can be pivoted by means of a pivoting motor not shown in the drawing against a support stop 26 affixed to the guide bar 29. The guide bar 29 also bears a spindle nut 31 for a spindle 32 which, via a spindle frame 12 with its load. The spindle with its nut forms a lifting and lowering device 14.

The support frame 12 is provided at the top with bores 21 for locking pins 20 mounted on the guide frame 15. The top of the guide frame 15 is provided, at each end, with two transverse members 19 in which are mounted cable pulleys 18 serving for the aforementioned supporting cables 8. The guide frame 15 consists of a central frame with vertical roller supports 17 affixed to its ends and serving for guide rollers 16 by which the guide frame 15 is guided on the stationary guide rails 6. As mentioned above, the guide rails 6 include, above the supports 4 provided with the running surfaces 5, a number of gaps 7 to give passage to the pivot arms 24 or to the wheels 13 of the support frame 12.

In Figure 3 the pivot arms 24, with the wheels 13, have been pivoted against the stops 26 by means of the aforementioned pivot motors not shown in the drawing. In Figure 4 the cables 8 have been lowered to the extent necessary to allow the wheels 13 to stand on the running surfaces 5. In Figure 5 the locking pins 20 have been removed

from the bores 21 and the guide frame 15 has been raised. In Figure 6 the support frame 12, with its wheels 13, has been moved over the running surfaces 5 as far as the desired storage surface 1. The spindles 32 have been rotated, by motors not shown in the drawing, in the direction required for a lowering action until the load 3 rests on the storage surface 1. In Figure 7, the locking lugs 45 have been released from the locking apertures 44 in the load 3 and the support frame has been raised by the spindles 32. In Figure 8 the support frame 12 has again been moved over a floor opening 2 and connected via its bores 21 with the locking pins 20 of the guide frame 15. In Figure 9 the cables 8 have raised the guide frame 15 with the support frame 12. In Figure 10 the pivot arms 24, with the wheels 13, have been pivoted downwards, while in Figure 11 the support frame 12, connected with the guide frame 15, has been connected via locking lugs 45 and via the apertures 44, with a smaller load container 3.

In the example shown in Figures 12—21 the guide frame 15 is in accordance with that already described. Each wheel 13 is displaceable, with a displacement support 34, in a horizontal displacement guide 35 of the support frame 12, from a retracted position into the required position on the running surface 5. The lifting and lowering device 14 for the load container 3 will be explained in due course.

In Figure 12 the wheels 13 have been retracted into the supporting frame 12, so that the latter can be lifted past the guide rails 6. In Figure 13 the wheels 13 have been moved to a position above the running surfaces 5, while in Figure 14 they have been deposited on these latter. In Figure 15 the locking pins 20 have been released from the bores 21 and the guide frame 15 has been lifted off the support frame 12. In Figure 16 the lifting and lowering device 14 has deposited the load container 3, while in Figure 17 the locking lugs 45 have been withdrawn from the apertures 44 of the load container 3. In Figure 18 the guide frame 15 has been re-connected via its locking pins 20 with the bores 21 of the support frame 12, which in Figure 19 it has once again been lifted off the running surface 5 by its wheels 13. In Figure 20 the wheels 13 have been retracted into the support frame 12, while in Figure 21 the lifting and lowering device 14 and the locking lugs 45 have been moved to a shorter distance from each other, in order to accommodate a smaller load container 3.

Figures 22—25 show details of the storage installation with the horizontally displaceable wheels 13. The central transverse support 15a of the guide frame 15 is screw-connected, at its ends, to the vertical roller supports 17 for the guide rollers 16 moving

along the guide rails 6. The roller supports 17 are provided at the upper end with inlet guides 22 by which the guide frame 15, with the guide rollers 16, is once again accurately guided in relation to the guide rail 6, after passing through a gap 7. As previously mentioned the guide frame 15 is provided at each end with two transverse supports 19 for mounting the cable pulleys 18 and plates 21a with bores 21 to accommodate the locking pins 20 affixed to the support frame 12. In addition, the guide frame 15 is provided with a suspension lug 23 at each end.

The support frame 12 has two longitudinal members 12a, interconnected at their ends via transverse members 12b. Each end of the longitudinal members 12a contains a displacement guide 35 for displaceable supports 34, on which are mounted the wheels 13 and their motors 27. To enable the wheels 13 to be brought into a position in line with their rails and to be returned to their stowed positions, each support 234 is connected by a device 36 to an endless drive chain 37 looped around the sprocket of a drive motor 38, mounted on the longitudinal member 12a and also around a further sprocket 39, rotatably mounted on the longitudinal member 12a. As shown most clearly in Figures 23 and 25, each of two traversing trolleys 40 has two motors 41 driving respective sprockets. Each sprocket engages with a chain 42 which is fixed at its ends to the support frame 12 and serves as a rack, whereby the traversing trolley is movable along the length of the load to be carried.

Each trolley 40 bears one of the aforementioned lifting and lowering device 14 which consists of two pressure cylinders 14a of which the piston rods 14b, via tackle blocks 14c lift and lower a locking support 43 with the locking lugs 45.

WHAT WE CLAIM IS:—

1. A storage installation including a plurality of superposed storage bays and apparatus for transporting loads to and from the storage bays and apparatus for transporting loads to and from the storage bays, said apparatus comprising a lifting device for raising and lowering a load support frame within a vertically extending shaft which opens to the storage bays, the shaft being delimited on two opposite sides by a respective pair of running surfaces associated with each of the storage bays, the load support frame having running wheels which are movable from stowed positions disposed wholly within the confines of the shaft as delimited by the pairs of running surfaces, to working positions in which the wheels are engagable with the running surfaces of any selected bay, whereby the load support frame may be run out of the shaft into the selected bay.

from the bores 21 and the guide frame 15 has been raised. In Figure 6 the support frame 12, with its wheels 13, has been moved over the running surfaces 5 as far as the desired storage surface 1. The spindles 32 have been rotated, by motors not shown in the drawing, in the direction required for a lowering action until the load 3 rests on the storage surface 1. In Figure 7, the locking lugs 45 have been released from the locking apertures 44 in the load 3 and the support frame has been raised by the spindles 32. In Figure 8 the support frame 12 has again been moved over a floor opening 2 and connected via its bores 21 with the locking pins 20 of the guide frame 15. In Figure 9 the cables 8 have raised the guide frame 15 with the support frame 12. In Figure 10 the pivot arms 24, with the wheels 13, have been pivoted downwards, while in Figure 11 the support frame 12, connected with the guide frame 15, has been connected via locking lugs 45 and via the apertures 44, with a smaller load container 3.

In the example shown in Figures 12—21 the guide frame 15 is in accordance with that already described. Each wheel 13 is displaceable, with a displacement support 34, in a horizontal displacement guide 35 of the support frame 12, from a retracted position into the required position on the running surface 5. The lifting and lowering device 14 for the load container 3 will be explained in due course.

In Figure 12 the wheels 13 have been retracted into the supporting frame 12, so that the latter can be lifted past the guide rails 6. In Figure 13 the wheels 13 have been moved to a position above the running surfaces 5, while in Figure 14 they have been deposited on these latter. In Figure 15 the locking pins 20 have been released from the bores 21 and the guide frame 15 has been lifted off the support frame 12. In Figure 16 the lifting and lowering device 14 has deposited the load container 3, while in Figure 17 the locking lugs 45 have been withdrawn from the apertures 44 of the load container 3. In Figure 18 the guide frame 15 has been re-connected via its locking pins 20 with the bores 21 of the support frame 12, which in Figure 19 it has once again been lifted off the running surface 5 by its wheels 13. In Figure 20 the wheels 13 have been retracted into the support frame 12, while in Figure 21 the lifting and lowering device 14 and the locking lugs 45 have been moved to a shorter distance from each other, in order to accommodate a smaller load container 3.

Figures 22—25 show details of the storage installation with the horizontally displaceable wheels 13. The central transverse support 15a of the guide frame 15 is screw-connected, at its ends, to the vertical roller supports 17 for the guide rollers 16 moving

along the guide rails 6. The roller supports 17 are provided at the upper end with inlet guides 22 by which the guide frame 15, with the guide rollers 16, is once again accurately guided in relation to the guide rail 6, after passing through a gap 7. As previously mentioned the guide frame 15 is provided at each end with two transverse supports 19 for mounting the cable pulleys 18 and plates 21a with bores 21 to accommodate the locking pins 20 affixed to the support frame 12. In addition, the guide frame 15 is provided with a suspension lug 23 at each end.

The support frame 12 has two longitudinal members 12a, interconnected at their ends via transverse members 12b. Each end of the longitudinal members 12a contains a displacement guide 35 for displaceable supports 34, on which are mounted the wheels 13 and their motors 27. To enable the wheels 13 to be brought into a position in line with their rails and to be returned to their stowed positions, each support 234 is connected by a device 36 to an endless drive chain 37 looped around the sprocket of a drive motor 38, mounted on the longitudinal member 12a and also around a further sprocket 39, rotatably mounted on the longitudinal member 12a. As shown most clearly in Figures 23 and 25, each of two traversing trolleys 40 has two motors 41 driving respective sprockets. Each sprocket engages with a chain 42 which is fixed at its ends to the support frame 12 and serves as a rack, whereby the traversing trolley is movable along the length of the load to be carried.

Each trolley 40 bears one of the aforementioned lifting and lowering device 14 which consists of two pressure cylinders 14a of which the piston rods 14b, via tackle blocks 14c lift and lower a locking support 43 with the locking lugs 45.

WHAT WE CLAIM IS:—

1. A storage installation including a plurality of superposed storage bays and apparatus for transporting loads to and from the storage bays and apparatus for transporting loads to and from the storage bays, said apparatus comprising a lifting device for raising and lowering a load support frame within a vertically extending shaft which opens to the storage bays, the shaft being delimited on two opposite sides by a respective pair of running surfaces associated with each of the storage bays, the load support frame having running wheels which are movable from stowed positions disposed wholly within the confines of the shaft as delimited by the pairs of running surfaces, to working positions in which the wheels are engagable with the running surfaces of any selected bay, whereby the load support frame may be run out of the shaft into the selected bay.



2. An installation as claimed in claim 1, including a guide frame movable vertically within said shaft by the lifting device, the guide frame being connectable to the support frame and having rollers which are rotatable about horizontal axes and which engage with guide rails extending vertically within the shaft, the guide rails being interrupted in the vicinity of the running surfaces.
3. An installation as claimed in claim 2, wherein the guide frame is arranged to overlie the support frame and has elements which are releasably engagable within apertures in the support frame.
4. An installation as claimed in claim 2 or claim 3, wherein the lifting means is disposed above said shaft and is connected to the guide frame by cables.
5. An installation as claimed in claim 4, wherein the guide frame has mountings on which pulleys are supported, and the cables pass around the pulleys.
6. An installation as claimed in any preceding claims, in which the support frame is provided with drive means for driving the running wheels.
7. An installation as claimed in any preceding claim, wherein each of the running wheels is mounted on a support arm which is pivoted to the support frame for movement between the stowed and working position.
8. An installation as claimed in claim 7, wherein each of the wheel support arms is pivotable about a horizontal axis, and is associated with a stop against which the arm bears when the wheel is in its working position.
9. An installation as claimed in claim 8, wherein each arm is pivoted to a guide bar which is displaceable vertically with respect to the support frame whereby the height of the frame relative to the wheels is adjustable.
10. An installation as claimed in claim 9, wherein a threaded spindle is associated with each running wheel, the spindle bearing at one end against the frame and being received in a nut carried by the guide bar of the running wheel, whereby rotation of said spindle adjusts the position of the frame relative to the wheel.
11. An installation as claimed in any of claims 1 to 6, wherein each wheel is mounted on a support which is guided for movement in the direction transversely of the frame.
12. An installation as claimed in claim 11, wherein each wheel support is connected to an endless traction element, and a motor is mounted on the support frame for circulating the traction element and thereby displacing the wheel support.
13. An installation as claimed in any preceding claim, wherein the support frame is provided with two trolleys for attachment to a load to be supported, the trolleys being traversable relative to the support frame.
14. An installation as claimed in claim 13, wherein associated with each trolley is at least one rack member extending along the support frame, and the trolley has at least one motor provided with a sprocket meshing with the rack member.
15. An installation as claimed in claim 14, wherein the or each rack member is constituted by a chain which is fixed at its ends to the support frame.
16. An installation as claimed in any of claims 13 to 15, wherein each trolley is provided with means for raising and lowering a support member having lugs engagable with apertures of load containers.
17. A storage installation substantially as hereinbefore described with reference to any of Figures 1 to 11, or 14 to 21, or 22 or 24 of the accompanying drawings.
- BROOKES & MARTIN,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London WC1V 6SE.
Agents for the Applicants.

