Title: MECHANIZED WAREHOUSE ASSEMBLED OF METAL BUILDING UNITS

Abstract: The subject of the invention is a mechanized warehouse assembled of metal building units for the storing of loading units and especially vehicles, which includes a base consisting of several superimposed storage levels and storage lots located radially per storage level, a central shaft located in the centre of the base bordered by the storage lots and a lifting device movable upwards and downwards in the central shaft and the connecting movable unit, where the lifting device has a supporting body for the support of the loading unit including a sliding device and a rotating mechanism located between the sliding device and the supporting body; and the at least one connecting level for the inserting and removal of the loading unit is attached to the central shaft. The characteristic feature of the invention is that in the central shaft (11) independently from the one lifting device (20) another movable lifting device (30) is located; and the moving unit (40) with one of the moving units (41) connecting to one of the lifting device (20) and the other moving sub-unit (42) connecting to the other lifting device (30), where one of the moving sub-unit (41) and the other moving sub-unit (42) is connected to each other through a actuation control centre (43), and the central shaft (11) is completed with a service tunnel attachment (12,13) in the section of the central shaft (11) located under and/or above the storage levels (15) suitable for receiving of one of the one lifting device (20) or the other lifting device (30).
Mechanized warehouse assembled of metal building units

The subject of the invention is a mechanized warehouse assembled of metal building units for the storing of loading units and especially vehicles, which includes a base consisting of several superimposed storage levels and storage lots located radially per storage level, a central shaft located in the centre of the base bordered by the storage lots and a lifting device movable upwards and downwards in the central shaft and the connecting movable unit, where the lifting device has a supporting body for the support of the loading unit including a sliding device and a rotating mechanism located between the sliding device and the supporting body; and the at least one connecting level for the inserting and removal of the loading unit is attached to the central shaft.

As the number of the vehicles increases and the dimensions of the available ground parking lots of the city decreases the storage of the vehicles became more and more serious problem nowadays. For the placing of many vehicles on small area several different solutions were developed already. Such multi-storey parking buildings are known, in which several cars can be stored in a relatively small area on the superimposed parking levels.

The deep-level garages can be classified in one of these groups, whose essence is that the vehicles are stored under the ground. But a considerable disadvantage of the multi-storey deep-level garages is that they need large earthworks and difficult foundation works. Or even, the stability of the ambient constructive works must be kept, which increase further the costs of the investment. In addition, the deep-level garages have another disadvantage: the access roads must be built out also, on which the vehicles can pass onto the parking levels, which considerably decreases the effective area available for parking. And if in favour of increasing the parking area the vehicles are got to the given parking lot by the help of engineering solutions and back to the site of taking-over; then the decrease in effectiveness originating from the failure of these difficult equipments and the conventional versions increases the costs of investment, operation and maintenance.

There are multi-storey parking towers also, in which the individual parking levels are
located above the ground level. Their building costs can be more advantageous, but their
disadvantages are fundamentally the same with the ones listed at the deep-level garages,
since the access roads connecting the levels takes large places from the parking lots also.

In favour of increasing the effective area the vehicles are got to the parking lot by the
help of engineering equipments. For example, the Publication Document N\textsuperscript{2} US
2006/018738 introduces such a parking tower, in which the individual vehicles are placed
on trays and the tray are lifted to the given level and they are slid on a roller bed to the
appointed parking It. The basic disadvantage of this solution is that the storage and freeing
of the vehicles is difficult, therefore the service time is long.

At the construction included in the patent of the register N\textsuperscript{2} of GB 1.185.456 the parking
tower consists of storage lots located in superimposed and parallel lines, whose one side is
opened. The vehicle to be parked is moved to the given level with a lift structure, and the
same lift moves it away horizontally to the given level, to the given storage lot. In this
version the storage and the out-giving operation is simple and well-traceable, but the
parking tower - owing to the arrangement of the storage lots —has weak capacity and the
storage in and out is energy-demanding.

At the parking tower introduced in the patent specification of the register N\textsuperscript{0} of US
5.314.284 the storage areas are located in a rectangular prism shaped base, and the storage
areas border a similar rectangular prism shaped central shaft. And in the central shaft the
vehicles are transported by such a lifting structure, which can move in two perpendicular
directions besides lifting and lowering; or even it can rotate around the lifting direction as a
shaft. The evident advantage of this version is that it ensures a better space utilization, but
it is an energy- and time-demanding procedure owing to the necessary multidirectional
movements.

In addition, a further consideration of this and the other known parking tower
construction is that if the only lifting device operating in the shaft breaks down the system
is disabled and until the error has been repaired neither the reception, nor the take-out of
the vehicles is possible.

Another disadvantage is that owing the single service lifting device the placement and
removing of the vehicle to the take-over point is difficult and need long time, which deteriorates the effectiveness of the service.

With the warehouse introduced in the invention our aim is to eliminate the deficiencies of the known parking towers and creating such a version, in which on the maximum loading unit can be placed in a small area in a way that the storage and the taking-back can be realized in an acceptably short time independently from the physical location of the storage area in case of the largest distance also; and the storage building can be operated continuously under all circumstances in a trouble-free way.

The basis of the invention idea was the recognition that if the parking lots of the warehouse designed as parking lots are arranged radially, and we create a cylinder-shaped central shaft, in which two lifting devices are operated independently from each other harmonizing the operation of the lifting devices by the help of a actuation control centre at all times; in addition, the central shaft is equipped with service tunnels and a connecting level being different from the conventional ones. In this way the time needed for the parking in and out can be decreased by the help of the actuation control centre and if one of the lifting devices breaks down or needs maintenance the operation of the warehouse needn't to be suspended and in this way the tasks can be solved.

For the storing of loading units and especially vehicles, which includes a base consisting of several superimposed storage levels and storage lots located radially per storage level, a central shaft located in the centre of the base bordered by the storage lots and a lifting device movable upwards and downwards in the central shaft and the connecting movable unit, where the lifting device has a supporting body for the support of the loading unit including a sliding device and a rotating mechanism located between the sliding device and the supporting body; and the at least one connecting level for the inserting and removal of the loading unit is attached to the central shaft.

The speciality of the solution is that in the central shaft independently from the one lifting device an other movable lifting device is located; and the moving unit with one of the moving units connecting to one of the lifting device and the other moving sub-unit connecting to the other lifting device, where one of the moving sub-unit and the other
moving sub-unit is connected to each other through a actuation control centre, and the central shaft is completed with a service tunnel attachment in the section of the central shaft located under and/or above the storage levels suitable for receiving of one of the one lifting device or the other lifting device.

Another criterion of the warehouse introduced in the invention can be that the base has at least two connecting levels. The two connecting levels are located at different stage levels in the base.

In another version of the warehouse one of the lifting devices are equipped with a pushing - pulling structure connected to the supporting body; and the pushing - pulling structure has profiles to catch and temporarily support the loading unit; in addition, the other lifting device is equipped with a horizontal pushing - pulling structure connected to the supporting body; and that pushing - pulling structure has profiles to catch and temporarily support the loading unit.

Another different shape of the invention the retainer plates of the storage areas placed on the storage level are positioned as slope from the direction of the central shaft outwards. In the environment of the external border of the retainer plate opposite to the central shaft one or more attachments are installed projecting from the retainer plate; and there are one or more wheel-guide unit and/or wheel-receiver seating.

Another version of the warehouse the actuation control centre has a programmable control unit; and the control unit is connected to one of the carrying member via a control input and a command output and it has another control input and a command output connected to the other supporting member. The control unit is a computer.

The warehouse introduced in the invention has several advantageous features. The most important of them is that the design of the base and the arrangement of the central shaft and its unconventional complement and the unique arrangement and operation of the lifting devices moving in the central shaft facilitate the arrangement of the most loading units in small area in a way that they can be moved effectively, quickly, continuously and with an energy-demand being lesser than usual.
It is a considerable advantage that all of the engineering units needed for the movement of the loading units are included in the lifting device; therefore owing to the use of the central shaft completed with innovative service tunnel sections the lifting device can be repaired without disturbing the other - and accordingly the functional operation of the warehouse - out of the working area of the central shaft serving for the real movement of the loading units. This was not possible at the known solutions yet.

Owing to the design of these structures it is an advantage that during the lifting of the loading unit the supporting body is rotated around the vertical axis and in this way the loading unit is positioned to the storage area in the period lapsing between the location of the loading unit on the lifting device and the arrival of the lifting device to the given storage level. This decreases the cycle time.

It is important to highlight the advantageous effect originating from the application of the service tunnel that either the one or the other lifting device can serve all the storage lots of the complete warehouse itself, since if one of the lifting device is in one of the service tunnels because of a failure or inspection, then it does not block the movement of the other.

It can be listed among the advantages that during the movement of the loading unit until storage area the loading unit itself travels a minimal distance; therefore the risk of damaging during movement actually is negligible, which is an especially important requirement in case of vehicles.

It can be listed among the advantages that owing to the base to be assembled of prefabricated metal elements the height of the warehouse can be varied in a wide range as per request of the Client; or even if the elements are fixed to each other the warehouse can be demolished, if needed and it can be re-erected to another location. And it can be an important requirement in case of different temporary warehouses of high capacity demand, e.g. fast installation of food and medicine help centres.

Also owing to the prefabricated elements the parts of the base can be transported simply; the base itself can be finished in a short time with relatively small live labour demand, which can effect the costs of the investment in an advantageous way.
The simple design and the concentrated arrangement of the engineering equipments have a positive effect in the costs of maintenance. And the continuous operation decreases the specific costs. Accordingly, the warehouse itself can be built with smaller investment costs than the conventional parking towers having the same capacity. Its operational costs are lower and owing to the continuous operation its profitability always exceeds the values, which can be reached with the conventional versions.

The warehouse introduced in the invention will be introduced in connection with a sample of execution on the basis of a drawing. On the drawing

Fig. 1 is the longitudinal section of one of the possible versions of the warehouse introduced in the invention;

Fig. 2 is the section of that warehouse introduced on Diagram along plan H-II;

Fig. 3 is the schematic drawing of one of the lifting devices in perspective representation.

On Diagram 1 and 2 such version of the warehouse introduced in the invention can be seen, in which 10 bases form one parking tower. The 10 bases are built up from pre-fabricated metal elements in a way that the metal building units are fixed by bolting, welding or their combination to form a load-carrying structure. The connection method of the structural elements always depends on the dimensions of the 10 bases, its loading and the planned period of use. But, it is expedient on every account to apply durable surface-treatment providing corrosion-protection already before the erection on the structural elements of the 10 bases made of metal, which can be some galvanic coating or hot-dipped galvanizing, or even a suitable painting also.

To meet the given requirements, the 10 bases include 16 storage levels, which are located one above the other; since on the individual storage levels - as shown on Diagram 2 - the 17 storage areas designed to receive the individual loading units can be found in a radial arrangement. The 17b internal edges of the 17 storage areas arranged in this border a 11 central shaft of circular cross-section, which finally serves for moving the 1 loading units to be moved to the 17 storage areas.
It must be noted that in this version the 17 storage areas and the 17a retainer plates are made of surface-treated metal, and they are suitable to store the vehicles considered as 1 loading unit safely. In favour of this that 17a retainer plates include the 17d buffer projection of the 17a retainer plate located next to the 11 central shaft and opposite to the internal border of 17b and closer to the external border of 17c; in addition, the 17e wheel guide element and the 17f wheel reception pocket connected o 17e wheel guide element. The 17e wheel guide element's task is to guide the wheels of the vehicles handled as 1 loading unit during its movement; since the aim of the 17f wheel reception pocket's aim is to position the vehicle handled as 1 loading unit suitably during the storage of the vehicle on the 17 storage area by making the wheels resting in the 17f wheel reception pocket, which the wheels cannot leave without external force. Accordingly, the 17f wheel reception pocket is enough deep to temporarily catch the wheel of the vehicle pushed on the 17a retainer plate of the 17 storage area, when it rolls in 17f wheel reception pocket. It is reached by positioning the vehicles toward 11 central shaft with their forepart on the 17 storage area. The 17d buffer projection located on 17a retainer plate serves safety purposes; and its task is to stop the rear wheel of the vehicle starting to roll towards the 17c external border of the 17a retainer plate, if it might leave 17f wheel reception pocket. This precaution is necessary because the 17a retainer plate is aslope from the internal border of 17b bordering the 11 central shaft towards the 17c external border of 17a retainer plate to make the liquid, rain and slush possibly dropping from the 1 loading unit onto the 17a retainer plate leave the 17a retainer plate. Of course, the liquid assembled at the 17c external borders is moved to the suitable treatment locations by suitable building engineering units.

In addition, the 10 base includes the 14 connecting level and the 15 connecting level, which connect to the 11 central shaft of the 10 base at a suitable position. The 14 and the 15 connecting levels' task is to facilitate that the 1 loading units to be stored move to and from 11 central shaft.

Here it must be noted that besides the 14 and the 15 connecting level further similar holes can be located in the 10 base facilitating the entry and exit of the 1 loading unit to/from the area of the 10 base, but the existence of more than two 14 and 15 connecting
levels is not obligatory. The connection of 14 and the 15 connecting levels to 11 central shaft always depends on the site characteristics of the ground including the 10 base; accordingly there can be a solution, in which between the connection of the 14 and 15 connecting levels to 11 central there is a difference of two or three 16 storage levels also. Or even, it can happen that 14 connecting level connects to the 11 central shaft at ground-level or above and the 15 connecting level connects under the ground-level. But if we wants to simplify the architectural works, then it is advantageous on every course, if at least the 14 connecting level or the 15 connecting level is at ground-level.

Diagram 1 represents well that in the 10 base in the line of the 11 central shaft, above the 11 central shaft the 12 service tunnel is located; since under the 11 central shaft the 13 service tunnel can be found. Actually, the 12 service tunnel and 13 service tunnel are the continuation of the 11 central shaft, and forms one unit with it, but its task differs from the task of the 11 central shaft. Namely, the 12 and 13 service tunnels serve to receive the 20 and 30 lifting devices moving in the 11 central shaft during maintenance. Of course, it can happen that the 12 service tunnel forms the part of the lowest 16 storage level, since the 13 service tunnel forms the part of the uppermost 16 storage level. But this arrangement might limit the capacity of the warehouse during the repairing of the 20 and 30 lifting devices, since the 20 lifting device located in the 12 service tunnel or the other 30 lifting device located in the 13 service tunnel block the 17 storage areas located at the 16 storage level.

On Diagram 1 we can see clearly that in the 11 central shaft of the 10 base two independently operating 20 and 30 lifting devices are located. The 20 lifting device is lifted or lowered by 41 one of the moving sub-units of the 40 moving unit; since the other 30 lifting device is lifted or lowered by the 42 second actuating elements of 40 moving unit to the desired 16 storage level of the 11 central shaft. The control and optimization of the relative movement of the 41 and the 42 second actuating elements is executed by the 43 actuation control centre of the 40 moving unit, which includes the 43a control unit. The 43a control unit is a high-speed computer, which continuously monitors the operation of the 41 and the 42 second actuating elements. In favour of making the 20 and the 30 lifting devices be accurate in loading in or out the 1 loading units to/from 17 storage area, the 43 actuation control centre's 43a control unit is in connection not only with the 41 and the 42
second actuating elements. The 43a control unit connects via its 43b first control input and its 43c command output to the 41 first actuating element and the 20 lifting device also; in addition via its 43d second control input and the 43e second command output to the 42 second actuating element and the other 30 lifting device also.

Now changing to Diagram 3 we can see the detailed arrangement plan of the 20 lifting device. It can be seen that the 20 lifting device include the 21 supporting body, the 22 sliding device, the 23 rotating mechanism and the 24 pulling - pushing structure. The 22 sliding device consists of the 22a rail elements and the 22b trays. The 22 sliding device's 22a rail element is located vertically on the lattice structure of 10 base. In this version, the U-shaped 22b tray connects to this 22a rail element, which is fixed to the 32b stable element of the 23 rotating mechanism. The 22b tray can slide on 22a rail element vertically, but it blocks the 23h stable element of the 23 rotating mechanism of 20 lifting device to turn from 10 base. On the contrary, the 23a rotating element of the 23 rotating mechanism can turn from the 23b stable element by the help of the 23c rotating element; and therefore the 21 supporting body fixed to 23a rotating element - which is responsible from the lifting and lowering of the 1 loading unit in the 11 central shaft —can turn from the 10 base around a vertical shaft. In this way, the 22 sliding device of the 20 lifting device and the 23 rotating mechanism facilitate that the 21 supporting body carrying the 1 loading unit can move in the 11 central shaft of the 10 base upwards and downwards; and it also can rotate the 1 loading unit in the 11 central shaft.

The 24 pulling - pushing structure of the 20 lifting device is responsible for unloading the 1 loading unit placed on the 21 supporting body of the 20 lifting device to the 17a retainer plate of any of the 17 storage areas at the 16 storage level. To execute this task the 24 pushing-pulling structure includes the 24a connecting profile, which - in this version - is such an attachment, which can be contacted to the wheels of the vehicle managed as 1 loading unit, and by the help of which the 1 loading unit can be pushed out from the 21 supporting body to the 17a retainer plate and it can be pulled back from the 17a retainer plate to the 21 supporting body. It must be noted that this task can be carried out with several - different - mechanical structures. But it is important that the 24 push-pull device must have a free path from the 21 supporting body until the 17a retainer plate; therefore it
is advantageous, if the 24 push-pull device is a push unit starting from the 21 supporting of 20 lifting device, e.g. telescopic working cylinder, at whose free end the 24a connecting profile is located. After then the 24a connecting profile must be directed to the appropriate part of the 1 loading unit and connected to it temporarily.

We must note that the 24 push-pull device pulls the 1 loading unit from the 14 connecting level onto the 21 supporting body of the 20 lifting device. In this case - as shown on Diagram 3 —the design of the 21 supporting body can be similar to the 17e wheel guide element located on the 17a supporting plate the 17f wheel reception pocket. The 24a connecting profile of the 24 push-pull device fixes the 1 loading unit on the 21 supporting body.

Returning to Diagram 1 we can see that finally the other 30 lifting device includes the 31 supporting body, that 32 sliding device and the 33 rotating mechanism and the 34 push-pull device and the 34a connecting profile. Considering its structure and operation, the other 30 lifting device is the same as the 20 lifting device, so we eliminate its detailed introduction.

To improve the safety movement of the 1 loading unit, as shown on Diagram 2 and 3 also, the cross-section of the 21 supporting body of the 20 lifting device and of course the cross-section of the 31 supporting body of the other 30 lifting device also are circular, and they are less smaller then the cross-sectional dimension of 11 central shaft. In the case of such geometric relationships the pushing of the 1 loading unit from the 21 supporting body to the 17a retainer plate has no risk factor.

But it is important to highlight that all engineering devices needed for the movement of the 1 loading unit at a given 16 storage level are located on the 20 and 30 lifting devices.

In this way, finally, the inspection, maintenance and replacement of the moving parts can be carried out in a simple way in the 12 service tunnel or in the 13 service tunnel.

It must be noted also that - of course —the 10 base can include a passenger elevator and/or a staircase and service ducts, which provide access to the 16 storage levels and facilitate the inspection of the structures. But it does not form the part of the essence of the
invention, therefore we do not introduce it in details.

The operation of the warehouse introduced in the invention is the following. Firstly, we form that 10 base considering the geological, geographical and town development features of the site of construction. And then we form the 14 and 15 connecting levels connecting to the 11 central shaft of the 10 base, one of which is located at ground-level and the other is under the ground-level. After assembling the metal structure of the 10 base the 22a rail elements of the 22 sliding device of the 20 lifting device can be erected on the vertical elements bordering the 11 central shaft of the 10 base. By the help if the 22a rail element and the sliding 22b trays the 20 lifting device can be fitted in the 11 central shaft. One of the 41 first actuating element of the 40 moving unit can be connected to the 20 lifting device; since one of the 43b first control inputs and one of the 43c command outputs of the 43a control unit of the 43 actuation control centre can be connected to one of the 41 first actuating elements and the 23 rotating mechanism of the 20 lifting device and the 24 push-pull device. Accordingly, the 20 lifting device is suitable to transport 17a retainer plates of the 17 storage areas to their installation position, where the individual 17a retainer plates can be fixed to 10 base also. Finally, the 30 lifting device can be inserted in the 11 central shaft of the 10 base and it can be connected with the 42 second actuating element. In addition, the 33 rotating mechanism of the 30 lifting device, the 34 push-pull device and the 42 second actuating element can be connected with the 43a control unit, the 43d second control input and the 43e second command output of the 43 actuation control centre.

It must be noted here that in favour of ensuring that the 20 lifting device and the 30 lifting device do not disturb each other during operation - in this version -, the 20 lifting device is suspended by the help of cables as usual in case of elevators, and it is connected to an electric-motor 41 first actuating element; since under the 30 lifting device an 42 second actuating element equipped with a hydraulic working cylinder is installed. Of course, the 41 and 42 second actuating elements can be selected freely considering the design requirements.

After building the warehouse the loading of the 1 loading units can be stalled. During this - considering the above-mentioned sample of design - the vehicle to be parked, which can be considered as 1 loading unit, stops before the 14 connecting level of 10 base, where
the possible passengers leaves the vehicle and just the driver remains in the car, and then
the vehicle goes into the 14 connecting level of the 10 base of the warehouse. Here also the
driver leaves the vehicle and the 14 connecting level also via a given path. When only the
empty vehicle stands in the 14 connecting level with released paring brake, then the 24
push-pull device of the 20 lifting device is activated, it opens towards the 14 connecting
level, where the 24a connecting profile of the 24 push-pull device connects to the suitable
part of the 1 loading unit, e.g. wheel, and the 1 loading unit is pulled into the 11 central
shaft via the 14 connecting level, where the 20 lifting device is located; and it direct it to
the 21 supporting body of the 20 lifting device. When the 21 supporting body of the 20
lifting device is loaded, 43 actuation control centre of the 40 moving unit receive a signal
via its 43b first control input that 1 loading unit arrived onto the 20 lifting device and it can
be stored. In this way, the 43a control unit sends out the suitable control signals via its 43e
command output to the 41 first actuating element, in addition, to the 23c rotating element
of the 23 rotating mechanism of the 20 lifting device that onto which 16 storage level must
the 1 loading unit standing on the 21 supporting body of the 20 lifting device be
transported and into which 17 storage lot position of the 16 storage level must the 21
supporting body by rotated.

Until the 21 supporting body of the 20 lifting device is lifted by the 41 first actuating
element and in the meantime it turns away also upon the effect of the operation of the 23c
rotating element, another 1 loading unit gets into the 11 central shaft via the 15 guide-
through of the 10 base —after the above-mentioned steps are finished —onto the 31
supporting body of the 30 lifting device located there. Now the 43a control unit - until it
coordinates the movement of the 20 lifting device - it receives the signal via the 43d
second control input that the 30 supporting body of the other 30 lifting device also received
a 1 loading unit; accordingly it selects a free 17 storage area at any 16 storage level of the
10 base. After selecting the newer 17 storage area it sends control signals via the 43e
second command output to the 42 second actuating element of the 30 lifting device and the
33 rotating mechanism to lift and rotate the 1 loading unit standing on the 31 supporting
body to a position being in accordance with the 17 storage lot.

When the 20 lifting device and the 30 lifting device are in the desired position, then the
24 push-pull device and the 34 push-pull device are activated. For this the 43a control unit of the 43 actuation control centre sends a command now via the 43c command output to the 24 push-pull device and the 24a connecting profile to turn the 24a connecting profile behind the wheel of the 1 loading unit, and then that 24 push-pull device pushes out the 1 loading unit from the 21 supporting body onto the 17a retainer plate of the given 17 storage area.

During the travel of the 1 loading unit its wheels contact the 17b internal border of the 17a retainer plate and rolling over on it they roll further directed by the 17e wheel guide element towards the 17c external border of the 17a retainer plate. When the wheel of the 1 loading unit reaches the 17f wheel reception pocket located along the 17e wheel guide element, then this happening is reported to the 43a control unit by one of the 43b first control input of the 43a control unit, and it sends "stop" signal via its 43c command output to the 24 push-pull device of the 20 lifting device, which stops the pushing-out procedure, and at the same time it turns out the 24a connecting profile of the 24 push-pull device from behind the wheel of the 1 loading unit. Finally, the 24 push-pull device is pulled back to a space bordered by the 21 supporting body of the 20 lifting device, i.e. to the section of the 11 central shaft.

Of course, this procedure is carried out during the operation of the 30 lifting device, upon the effect of which the other 30 lifting device moves the 1 loading unit onto the 17a retainer plate of the 17 storage area appointed by the 43a control unit of the 43 actuation control centre. After then the 20 lifting device and the 30 lifting device can return to their original position, but they can start to another 17 storage area, from where a 1 loading unit standing there must be moved back to the 14 connecting level or to the 15 connecting level. The 43u control unit determines that where the 1 loading unit is transported depending on that the 20 or the 30 lifting device is closer to the loading unit to be unloaded, and it sends the closer one for the 1 loading unit.

Suppose that now the 30 lifting device receives the command to unload the 1 loading unit from the appointed 17 storage lot. For this the 43a control unit receives the given position of the 30 lifting device via its 43d second control input, and after its evaluation it commands the 42 second actuating element via the 43e second command output and the 33
rotating mechanism to lift or lower and rotate the 31 supporting body. As the 31 supporting body is in the desired position, via the 43d second control input a signal arrives to the 43a control unit that the pulling-out of the 1 loading unit can be stalled. At that time 43a control unit via its 43e second command output commands the 34 push-pull device and its 34a connecting profile to be activated. The 34 push-pull device projects from the 31 supporting body of the 30 lifting device, and when it reaches the desired distance, then the 34a connecting profile turns behind the wheel of the 1 loading unit and it slowly starts to pull it back from the 17c external border of the 17a retainer plate of the 17 storage area towards the 17b internal border. The wheel of the 1 loading unit moves again; and it rolls over from the 17a retainer plate to the 31 supporting body of the 30 lifting device, where the movement of the 34 push-pull device finishes. In this way, by the help of the 30 lifting device the 1 loading unit can be transported to the 15 connecting level upon the effect of the signal sent to the 42 second actuating element. Of course, during the lowering of the 31 supporting body of the 30 lifting device owing to the 33 rotating mechanism the 31 supporting body turns into that position, by which the 1 loading unit arriving in the 15 connecting level can be pushed out straight away – by the help of the 34 pushing-pulling structure - from the 10 base to the 15 connecting level. The driver can take the vehicle arriving in the 15 connecting level after the operation of the 34 push-pull device is finished, who can leave the warehouse after starting the vehicle.

From the description of the operation of the 20 lifting device, the 30 lifting device and the 40 moving unit it is clear that the movement of the 20 lifting device and the 30 lifting device and - within some limitations - their direction is also independent from each other completely. The optimal movement and operation of the 20 lifting device and the 30 lifting device and their best possible utilization are coordinated by the 43 actuation control centre of the 40 moving unit, namely the 43a control unit. Accordingly, expediently, the 43a control unit is a high-speed and highly reliable computer, which runs an individual PC program being suitable for the operation of the warehouse.

If the 30 lifting device breaks down, either by operating the 42 second actuating element or by the well-known and usual manual operation, it must be lowered into the 13 service tunnel of the 11 central shaft of the 10 base, where the needed repairs can be carried out.
But during the break-down of the 30 lifting device the warehouse can operate further; provided that during the repair of the 30 lifting device only the 20 lifting device executes the loading and unloading tasks in the whole are of the warehouse.

When the 20 lifting device breaks down, then it must be moved into the 12 service tunnel of the 11 central shaft of the 10 base by the help of the 41 first actuating element or manually, where the maintenance can be carried out in an undisturbed way. Of course, the storing tasks are executed by the 30 lifting device at that time.

The same procedure is carried out also, when the 20 lifting device or the 30 lifting device have to go under regular maintenance.

In the above-mentioned sample the 1 loading unit is a vehicle, but of course, the 1 loading unit can be a containers rolling on wheels also.

The warehouse introduced in the invention can be applied well at all locations, where several loading units must be stored and handled effectively and continuously in a small area.
List of reference signs

1 loading unit

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<tr>
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<td>service tunnel</td>
</tr>
<tr>
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20 lifting device

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30 other lifting device

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40 moving unit

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<td>43c</td>
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<td>43d</td>
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<td>43e</td>
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Claims

1. The mechanized warehouse assembled of metal building units for the storing of loading units and especially vehicles, which includes a base consisting of several superimposed storage levels and storage lots located radially per storage level, a central shaft located in the centre of the base bordered by the storage lots and a lifting device movable upwards and downwards in the central shaft and the connecting movable unit, where the lifting device has a supporting body for the support of the loading unit including a sliding device and a rotating mechanism located between the sliding device and the supporting body; and the at least one connecting level for the inserting and removal of the loading unit is attached to the central shaft; characterised by that in the central shaft (11) independently from the one lifting device (20) an other movable lifting device (30) is located; and the moving unit (40) with one of the moving units (41) connecting to one of the lifting device (20) and the other moving sub-unit (42) connecting to the other lifting device (30), where one of the moving sub-unit (41) and the other moving sub-unit (42) is connected to each other through a actuation control centre (43), and the central shaft (11) is completed with a service tunnel attachment (12,13) in the section of the central shaft (11) located under and/or above the storage levels (15) suitable for receiving of one of the one lifting device (20) or the other lifting device (30).

2. The warehouse as in claim 1, characterised by that the base (10) includes at least two connecting levels (14, 15); and the one connecting level (14) and the other connecting level (15) are located at different storage levels (16) of the base (10).

3. The warehouse as in claim 1 or 2, characterised by that the one lifting device (20) is equipped with a horizontal push-pull device (24) connected to the supporting body; and the pushing-puling structure (24) has connecting profiles (24a) being suitable to catch and temporarily store the loading unit (1).

4. The warehouse as in claim 1 to 3, characterised by that the other lifting device (30) is equipped with a horizontal push-pull device (34) connected to the supporting body (31) and the push-pull device (34) connecting profiles (34a) being suitable to catch and
temporarily store the loading unit (1).

5. The warehouse as in claim 1 to 4, characterised by that the retainer plates (17a) of the storage areas (17) located at the storage level (16) are firmly fixed in the base (10) from the direction of the central shaft (11) outwards.

6. The warehouse as in claim 1 to 5, characterised by that in the environment of the external border (17c) of the retainer plate (17a) opposite to the central shaft (11) one or more buffer projections are (17d) installed projecting from the retainer plate (17a).

7. The warehouse as in claim 5 or 6, characterised by that on the retainer plate (17a) one or more wheel guide elements (17e) are installed.

8. The warehouse as in claim 5 to 7, characterised by that on the retainer plate (17a) one or more wheel reception pocket (17f) are installed.

9. The warehouse as in claim 1 to 8, characterised by that the actuation control centre (43) has a programmable control unite (43a) van, and the control unit (43a) includes the control input (43b) and the command output (43e) connected to the one lifting device (20) and the other control input (43d) and command output (43e) connected to the other lifting device (30).

10. The warehouse as in claim 9, characterised by that the control unit (43a) is a computer.
A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or both National classification and IPC:

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

ED4H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>DE 102 48 441 B3 (DAIMLER CHRYSLER AG [DE]) 22 July 2004 (2004-07-22) paragraph [0065] - paragraph [0068]; figures 6-15</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search: 18 July 2007

Date of mailing of the international search report: 25/07/2007

Authorized officer: Zuurveld, Gerben
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