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(54) **Title:** VERTICAL REPEATING UNIT OF A STORAGE SYSTEM

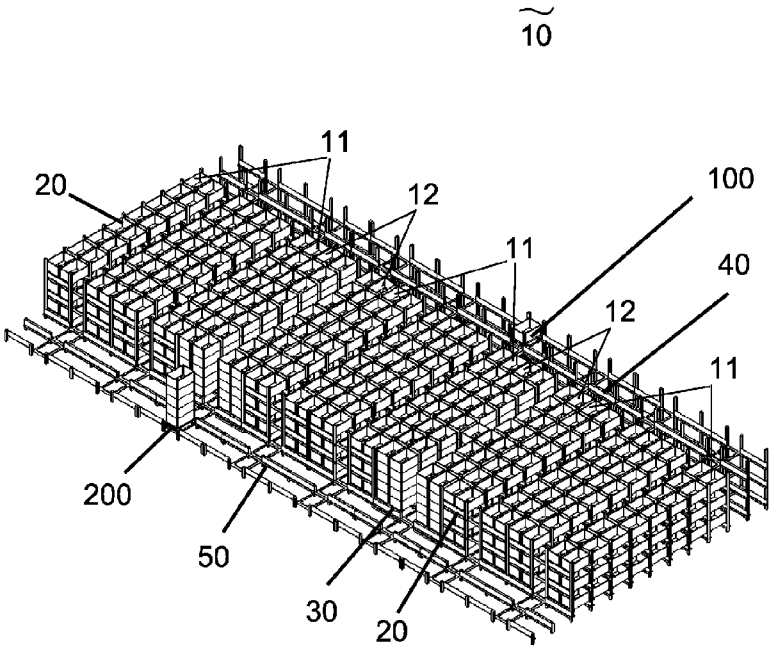

Fig.1

(57) **Abstract:** The present invention relates to a single vertical repeating unit of a storage system for storing and organizing materials, comprising: two different types of storage areas, a first type having a plurality of storage levels in a vertical direction each storage level comprising a plurality of storage spaces, the storage spaces are arranged in parallel rows (SA1) in one horizontal direction and one vertical direction, the storage spaces are adapted for receiving individual boxes accommodating materials, and at least some of the individual storage spaces are provided as receptacles supporting individual stored boxes, preferably on at least two of their edges, the receptacle leaving a free space in the middle, such that an empty space accessibly by a person is provided when no boxes or a reduced number of boxes are stored in those storage spaces of one vertical row.

[Continued on next page]

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Vertical repeating unit of a storage system

Description

The present invention is directed towards a single vertical repeating unit of a storage system according to claim 1. Such systems are known with respect to the storage of either stacks of trays or single storage of trays. However, both systems have disadvantages with respect to the handling of gods with in the trays. The single stored trays need a lot of space for storage, for the trays and for maintenance access. The stacked trays maximize the usage of storage space but are less efficient when it comes to access to a specific tray in a stack of trays.

AT 5223344 A4 mentioned in the priority search report describes a rail crossing in a rack storage system.
A rack storage system of the desired type is described as being up to 200 meters long and 40 meters high (page 2, para. 3).
The crossing points of rail arrangements from prior art rack storage systems are described as disadvantageous, as they would prevent the use of the rack aisles as escape routes, since the crossing rails on the individual levels prevent personnel from

getting through (page 1, para. 5 to page 2, para. 1). As can be seen on the left-hand side of Figure 2, this refers to rack storage systems in which stored goods 3 are arranged next to each other and on top of each other in individual discrete storage areas.

This means that rails are arranged one above the other at short vertical distances.

If these storage racks were only a single level, maintenance personnel could climb over the one level of crossing rails at the crossing points. In fact, however, the storage systems in question are multi-level racking systems up to 40 meters high, with each level having rails and rail crossings.

With reference to Figure 1 of AT 5223344 A4, it is explained that, it is a multi-dimensionally accessible rack storage system in a schematic plan top view, whereby stored goods would be stacked on both sides along rack aisles 2a.

The "stacking" of stored goods presupposes that they are arranged on top of each other (page 6, paragraphs 3 and 4). The reference signs used in Figure 1 are shown in particular in the right-hand half of Figure 2. All statements relating to Figure 1 therefore also apply to the right-hand side of Figure 2. However, in the right-hand half of Figure 2, stored goods 3 are not depicted as stacked on top of each other as described in relation to Figure 1, but only a single layer of goods 3 is shown lying next to each other.

However, the stacking can be seen in the left half of Figure 2, which shows the actual storage rack arrangement.

According to Figure 2, vertical rows are proposed for the vertically individually stacked stored goods, so that the shelving system can reach the height of 40 meters (page 6, para. 4).

With regard to Figures 3 and 4, it is stated that (shelf)uprights 8 of the rack storage system 1 are provided. Looking at Figure 2, it can be seen that the (shelf)uprights 8 represent feet of the vertical shelf arrangement, on which higher levels of the storage system rest upon as they are shown on the left-hand side of Figure 2. However, the (shelf)uprights 8 are also shown on the right-hand side of Figure 2, which additionally indicates that in the right-hand half of Figure 2 only one level of the vertical shelf ar-

rangement, as shown in the left-hand half of Figure 2, is shown in order to provide a view of the special rail system. Hence it is just a visual omittance for clarity purposes. On the right-hand side of Figure 2, the other vertical planes have therefore been hidden in order to make the rail arrangement, which is considered to be of certain importance in this publication, particularly clearly visible.

The visual representation of the multidimensional rack storage arrangement as shown on the left-hand side would obstruct the view on the course of the individual rails. The rails would not be visible with the desired clarity.

Page 4, para. 3 shows, for example, that each rack aisle provides several levels at vertical intervals in which rack vehicles can travel. This corresponds to the illustration shown in the left half of Figure 2.

This means that several of the aforementioned rail crossings are located one above the other in the rack storage system. However, this would also lead to the before mentioned problem, which is considered a disadvantage in the prior art, that the rack aisles cannot serve as an escape route. The crossings would block the way.

This circumstance is taken into account by the rail crossing according to patent claim 1 of AT 5223344 A4, which enables the passage of personnel into the crossing area of the rails in a special way. The problem of the permeability of rail crossings for personnel is basically only present if there are several rail systems arranged one above the other, which together represent a labyrinth for personnel if they are to move along the rack aisle 2a.

For reasons of clarity, however, the discussion of the movable rail intersections in Figures 1 to 4 always refers to a single layer of shelving level, whereby in each of the figures the (shelf)uprights 8 are shown as an indication for the presence of the vertical storage shelving system shown in Figure 2 left-hand side and are intended to indicate that this is a simplified representation and to provide a clear view of what is essential according to this publication.

The (shelf)uprights 8 in Figures 2 to 4 only make technical sense if an overlying storagelevel is provided for further stored goods 3 in which the stored goods can be stacked, as required on page 6, para. 4 with regard to Figures 1 and 2.

Figure 2 therefore shows a standardized storage rack, whereby the other levels have been hidden in the right-hand half for reasons of clarity.
Consequently, Figure 2 does not show a storage system with 2 different storage areas, but a rack storage system as shown in the left half of Figure 2, whereby the other storage levels have been hidden in the right half of the picture for better visualization of the rail system considered to be the technical surplus of this publication. Also, nowhere in the description the is a mentioning or reference of a storage system with two different kinds of storage areas.

From WO2021059006A1 a system is known in which the main object is a transport mobile device designed to independently take a tray from a storage location and transport it in the storage and processing system of objects, as well as outside it, having the ability to move in two horizontal mutually perpendicular directions, by changing groups of support wheels, as well as moving between horizontal storage levels on inclined ramps. This device is equipped with a lifting table equipped with a group of rotary cams that rotate towards each other and provide both centering and fixation of the tray being transported on the table. A version of the object storage and processing system for this device is shown in Figure 5 of this document.

This system provides direct access to each tray in the storage area, which is an advantage of the solution

<u>The disadvantages of the object storage and processing system configured for this transport mobile device are:</u>

1. Due to the insignificant height of each storage level and the need to form a transport network at each of its levels to ensure the movement of transport mobile devices along it, the maintenance of system elements by personnel requires the creation of special service passages with a height of human height, which reduces the storage density of the system, and also makes it more expensive.

2. Under each storage location, space is required for the robot at approximately half the height of the tray.
3. Due to the fact that each transport mobile device can move only one tray at a time, the processes of shipping objects from the storage and processing system, as well as its replenishment, take a significant amount of time, which, in turn, increases processing time and reduces system performance as a whole.

From PCT/EP2022/058762 a system is known, in which the main object of t is a system for storing and processing objects in stacks of trays, where trays with objects are stored in stacks at storage locations located in two mutually perpendicular horizontal directions. For taking, installing and moving stacks of trays, transport mobile devices are designed that move along the transport network of the system and independently pick up and put stacks of trays from storage places. A version of the system for storing and processing objects in accordance with the publication is shown in Fig. 7 of this document.

This system is the most compact in terms of storage density.

The disadvantages of the system for storing and processing objects of the voiced publication are:

1. Complexity and longtime of collecting orders from objects stored not in the top trays of the stacks, as a result - an increase in the cost of the system, an increase in picking time, and a decrease in system performance.
2. The height of the stack of trays that the transport mobile device transports at one time is the limitation of the storage area.

The essence of the invention (a way to eliminate shortcomings).

The object storage and processing system proposed by us in the application is a combined system consisting of sections of the systems of the first and second publications, built at a certain frequency.

So, adding instead of the service passage (21), see fig. 5, the stacking area (30), the inventive system immediately gets three advantages over the system from the first publication of the prior art:

1. increased storage density while maintaining the periodicity of the system.
2. increased number of trays transported by one transport mobile device at a time, which greatly speeds up the filling of the system with goods and its shipment.
3. getting rid of the need to create additional service passages for personnel.

At the same time, the benefits of the inventive system over the second prior art publication are:

1. The system introduces storage areas for single trays with objects, the contents of which are much easier and faster to serve (pick orders) than in stacks.
2. The height of the storage area is no longer limited by the height of the stack or a multiple of it, and the object storage and handling system can occupy the entire height of the room in which it will be located.

Hence, the present invention solves the task of providing a system a storage system that has the benefits of both known types of storage systems without the shortcomings, whereby the usage of storage space in increased without losing the required access to the system e.g., for maintenance purposes.

According to the present invention this task is solved by a single vertical repeating unit of a storage system for storing and organizing materials, comprising: two differ-

ent types of storage areas (11, 12), a first type (11) having a plurality of storage levels in a vertical direction each storage level comprising a plurality of storage spaces (20), the storage spaces (20) are arranged in parallel rows (SA1) in one horizontal direction and one vertical direction, the storage spaces (20) are adapted for receiving individual boxes (001) accommodating materials, and at least some of the individual storage spaces (20) are provided as receptacles (400) supporting individual stored boxes, preferably on at least two of their edges, the receptacle leaving a free space in the middle, such that an empty space accessibly by a person is provided when no boxes or a reduced number of boxes are stored in those storage spaces (20) of one vertical row a second type (12) having a single storage level comprising a plurality of storage spaces (30) adapted to receive stacked boxes the storage spaces (30) are arranged in parallel rows (SA2) in one horizontal direction the height of the storage level of the second storage space is adapted for human access each storage space (20, 30) is connected to a rail network for transport of boxes between the storage spaces (20, 30) via a mobile transport unit (100/200) the rail network comprises two groups of rails (40, 50) the rails (40) of the first group connect the storage spaces (20) for individual boxes to the network the rails (50) of the second group connect the storage spaces (30) for stacked boxes to the network the rails (40, 50) and rows (SA1, SA2) of storage spaces (20,30) are arranged to each other in a single or reoccurring pattern (1 to n)SA1-RW1-(1 to 4)SA1-RW1-(1 to n)SA1, wherein n is a natural number, wherein for each appearance of the pattern there is either a SA2 or a RW2 next and parallel to the (1 to n)SA1 rows.

Preferred embodiments are recited in the dependent claims. Whereby each feature from each dependent claim is disclosed separately from any other dependent claim and combinable in any required way.

A receptacle according to the present invention can be any holding equipment that serves the purpose of holding a single tray in place without restricting access to its storage space while no tray is present. Preferably the receptacle is a set of plates arranged on edges of each storage space to support the edges of the tray but leaving

a space in the middle so a person can access the space while the tray(s) is/are not present as depicted e.g., in fig.9.

Human access according to the invention shall define a height that equals the number of trays in a vertical direction stored in single storage spaces that correlates to the height of a human. This can be anything from between 1 m to 2m or more, preferably up to 3m or more, such that a person can unhindered enter a vertical (sub)set of individual storage spaces (20) that is emptied out for granting access to any other horizontally neighboring storage spaces or for access to the rails (40) that are vertically only spaced apart by about the height of a tray in a vertical direction and would therefore require the service personnel to crouch along the rails 40 e.g. in the event an MTU gets stuck or other maintenance is required but the above described upright standing access was not provided.

Thus, an important difference to a single storage of a tray on a shelf is that the inventive storage space for individual boxes allows a person to enter the place where normally trays are stored, if an according number of trays in one vertical direction are removed.

With the above outlined inventive setup "(1 to n)SA1-RW1-(1 to 4)SA1-RW1-(1 to n)SA1" this allows for an unhindered access to all areas of the storage system without provision of dedicated service aisles that consume space which cannot be used for storage and without removing a huge number of trays to grant service access to a certain point in the system.

As a comparative example in fig. 5 a single tray storage arrangement is provided with service aisle. Without the service aisle maintenance, the middle of the system would require all boxes in the width of the system to be removed up to the position where maintenance is required. Thus, storage space is lost to the service aisles.

According to the present invention no service aisles are required since service person can move upright along the rail tracks 50 for the stacks of trays.

Thus, the specific inventive arrangement of single storage spaces + according rail tracks and stacked track spaces + according rail tracks render service aisles superfluous and increase the storage density of the system.

Additionally, the rail tracks 50 in case required the storage space for single trays can be turned into service passages by removal of enough trays to allow for human access / passage to the required part of the storage system without losing the individual access to the trays that are stored separately.

According to a preferred embodiment alternatively the first type of storage area has a reduced number of storage levels compared to the first type storage area.

The invention is further discussed with respect to the provided figures.

List of drawings

Fig. 1 shows a preferred embodiment of an object storage and processing system according to claim 1. Isometric view.

Fig. 2 shows a preferred embodiment of an object storage and processing system according to claim 1. View from above

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Fig. 3 shows a preferred embodiment of an object storage and processing system according to claim 1. Side view.

Fig. 4 shows a version of the service trolley (300). Isometric view.

Fig. 5 shows a prior art single object storage and processing system comprising single tray storage only .

Fig. 6 shows a transport mobile device (100) with a tray, designed to work in a system for storing and processing single objects. Isometric view.

Fig. 7 depicts a prior art tray stack only storage and handling system. Isometric view.

Fig. 8 shows a transport mobile device (200) with a stack of trays, designed to work in a system for storing and processing stacks. Isometric view.

Fig. 9 shows a storage space (20,30) for single tray storage where all trays in a vertical direction are removed for huma access.

The main object of the present invention is a combined storage and processing system 10 for objects, which includes storage areas for both single objects and their stacks. The system 10 is configured to work with mobile devices (100) moving single objects, as well as with stacks of objects. As objects processed in the system, in the given example, trays (001) are meant.

Fig. 1-3 show an embodiment of the inventive combined system (10) for storing and processing objects, configured to operate both types of transportation by mobile devices (100/200) . As can be seen from the figure, the combined system (10) for storing and processing objects includes a plurality of sections/rows (SA1) of multi-level storage of single trays (001), between which sections/rows (SA2) of stacked storage of trays (001) are placed. The sections SA1 comprise individual storage spaces (20) whereby the sections SA2 comprise storage spaces (30) for stacked trays. It is also seen in the figures that in the system (10) there are two types of transport mobile device transportation (100) and (200). However, generally the same mobile transport device (MTU) may be used for transportation to and from SA1 and SA2. Transport interchanges are provided to allow access for MTUs between the single tray storage section or between the tray stack storage sections, e.g., at the edges of the system.

So, for example on the northern edge of the combined system (10), there may be a transport interchange with rail track (40), designed to provide the ability to move transport mobile devices (100) between storage rows SA1 working with single trays (001), and on the southern edge there is a transport interchange with rail tracks (50) along which transport mobile devices (200) working with stacks of trays (001) can move between stack storage rows SA2. The transport interchange/rails (40), as well as the passages located in the areas of single storage of objects (11), are equipped with rail tracks at all levels of single storage of trays (001), in the example shown there are three of them (levels). At the same time, the interchange and the passages located in the areas of stacked storage of objects (12) have rail tracks (50) only at one level of storage, which may coincide with the lower level of storage of areas of single storage of objects (11).

Fig. 1-3 show a preferred embodiment of a combined object storage and handling system (10) in which tiered storage areas (11) of single trays (001) alternate with the stacking storage areas (12) of trays (001) at such intervals that the rail tracks, designed to move transport mobile devices (200), located in the aisle of the stacking area (12) could simultaneously function as a service passage for servicing the system (10) by personnel which can in one embodiment be described as the above mentioned (1 to n)SA1-RW1-(1 to 4)SA1-RW1-(1 to n)SA1, wherein n is a natural number, wherein for each appearance of the pattern there is either a SA2 or a RW2 next and parallel to the (1 to n)SA1 rows

In Fig. 2, top view, trays (001) stored in the single storage spaces (20) are indicated by a “circle”, while trays (001) stored in the stacking spaces (30) are indicated by “three rectangles” . Thus, it can be seen from the figure that from the passages located in the stacking spaces (30) with the stacks of trays (001) removed from the shelves, the service personnel (002) can reach any element of the combined storage and processing system of objects (10). Thus, the combination of sections of multi-level storage spaces (20) of single trays (001) with sections of stacked storage spaces (30) of trays (001) provides access for service personnel (002) to any place in the

system without organizing additional service passages, which increases the storage density of the system and reduces its cost. In contrast to the systems shown in the prior art, a service trolley (300) is designed to move personnel (002) along the service aisles (21), which can move in the aisles along the same rail tracks as transport mobile devices (100) and (200).

Fig. 1-3 show a preferred embodiment of a combined storage and processing system (10) for objects, in which both types of transport mobile devices (100) and (200) can be identical or similar and thus may have similar overall dimensions in the plan, which allows them to move along common rail tracks (40/50) for example, transport mobile devices (100), without restrictions, can use any rail tracks (40/50) intended for moving transport mobile devices (200) to move; at the same time, transport mobiles (200), empty, without stacks of trays (001) on board, can use all but especially the lower storage rail tracks (40) intended for transport mobiles (100). This feature greatly increases the throughput of the system.

Fig. 4 shows a version of a service trolley (300). Isometric view. As shown in the figure, the service trolley (300) contains a group of wheels (301), having the same track as the transport mobile devices (100) and (200), for moving along the service aisle (21), the body (302), to which wheels (301) and a transport platform (303) with anti-slip coating are attached. The variant of the service trolley (300) shown in the figure is not limiting. So, the service trolley (300) can be driven both by the muscular strength of the person himself (002), and be equipped with a drive and controlled either remotely from the personnel control panel (002), or automatically, by the control system for the storage and processing of objects (10). In addition, the transport platform (303) can be equipped with a device for moving personnel (002) in a sitting or other position, and can also be equipped with a body for transporting other elements of the system or tool in it.

Fig. 5 shows a portion of an object storage and handling system according to the state of the art. The figure shows that the system for storing and processing objects

includes three sections of multi-tiered single storage (20) of trays (001), separated from each other by service passages (21). Also, in the figure there are several transport mobile devices (100), and a road junction (40). It can be seen from the figure that the presence of service passages (21) reduces the storage density of the system, increasing its area. Service passages (21) are essentially a floor with free space above it in human height. In this case, instead of the floor, rail tracks of the lower storage level of the system are used, designed to move transport mobile devices along them (100), supplemented by a support surface for personnel (002). Personnel (002) are shown in one of the service aisles (21), to provide them with access to the trays (001) located behind the aisles for transport mobile devices (100), the nearest trays (001) adjacent to the service aisle (21) are removed .

Fig. 6 shows a transport mobile device (100) with a tray (001) standing on the table of the device, in accordance with the current state of the art, known from the publication WO2021059006A1.

Fig. 7 shows a section of the object storage and processing system, in accordance with the current state of the art. The figure shows that the system for storing and processing objects includes several sections of stacking storage (30) trays (001) with traffic interchange (50). The figure also shows several transport mobile devices (200) designed to move stacks of trays (001).

Fig. 8 shows a transport mobile device (200) with a stack of trays (001) standing on the table of the device, in accordance with the current state of the art, known from the publication PCT/EP2022/058762.

Fig. 9 shows a storage space (20) for single tray storage where all trays in a vertical direction are removed for human access.

Claims

1. A single vertical repeating unit of a storage system for storing and organizing materials, the repeating unit being stackable in a vertical direction comprising:
   a rail network, and
   two different types of storage areas (11, 12),
   - a first type (11) having a plurality of storage levels in a vertical direction
     - each storage level comprising a plurality of a first type of storage spaces (20),
     - the storage spaces (20) of the first type are arranged in parallel rows, called SA1 herein after, in one horizontal direction and one vertical direction,
     - the storage spaces (20) of the first type are adapted in height for receiving individual, hence a single box (001) in each storage level in the vertical direction, the height being limited by the distance to the next storage space (20) of the plurality of storage levels in a vertical direction, wherein the size of the boxes and the size of the single storage spaces (20) are adapted to each other and
     - at least some of the individual storage spaces (20) of the first type located vertically above each other are provided as receptacles (400) supporting the individually stored boxes, preferably on at least two of their edges, the receptacle leaving a free space in the middle, such that an empty space accessibly by a person is provided when no boxes or a reduced number of boxes are stored in a storage space (20) of the first type of one vertical row
   - a second type (12) having a single storage level
     - comprising a plurality of a second type storage spaces (30) each adapted to receive a stack of boxes

- the storage spaces (30) of the second type are arranged in parallel rows, called SA2 herein after, in one horizontal direction
- the height of the storage level of the second storage space is adapted for human access

- each storage space (20, 30) is connected to the rail network for transport of boxes between the storage spaces (20, 30), preferably via a mobile transport unit (100/200)
- the rail network comprises two groups of rails (40, 50)
  - the rails (40) of the first group, called RW1 herein after, connect the storage spaces (20) of the first type for individual boxes to the network
  - the rails (50) of the second group, called RW2 herein after, connect the storage spaces (30) of the second type for stacked boxes to the network
- the rails RW1 and RW2 (40, 50) and the rows SA1, SA2 of storage spaces (20,30) are arranged to each other in a reoccurring pattern (1 to n)SA1-RW1-(1 to 4)SA1-RW1-(1 to n)SA1, wherein n is a natural number, wherein for each appearance of the pattern there is a (1 or 2)SA2-RW2-(1 or 2)SA2 pattern next and parallel to the (1 to n)SA1 rows.

2. Vertical repeating unit according to claim 1,
wherein the rail network is a common rail network connecting the storage spaces (20, 30) of the first and second storage area (11, 12) to each other.

3. Vertical repeating unit according to any of the preceding claims
wherein the first level of the first type of storage area (11) and the first level of the second storage area (12) in case there is more than one, are equal.

4. Vertical repeating unit according to claim 1 or 2,
Wherein the first level of the first type of storage area (11) and the first level of the second storage area (12) are each the lowest level.

5. Vertical repeating unit according to any of the preceding claims,
wherein rails (40) of the first group are each arranged adjacent and parallel to one or two rows of storage spaces (20) for individual boxes as a multilevel arrangement of rails.

6. Vertical repeating unit according to any of the preceding claims,
wherein the rails (40) of the first group are interconnected providing access for the mobile transport unit (100/200) to individual storage spaces (20) in multiple rows and multiple levels of the first type storage area (11).

7. Vertical repeating unit according to any of the preceding claims,
wherein rails (50) of the second group (RW2) are each arranged adjacent and parallel to one or two rows of storage spaces (30) for stacked boxes as a single level arrangement of rails.

8. Vertical repeating unit according to any of the preceding claims,
wherein the rails (50) of the second group are interconnected providing access for the mobile transport unit (100/200) to storage spaces (30) for stacks of boxes in multiple rows.

9. Vertical repeating unit according to any of the preceding claims,
wherein the first and second group of rails (40, 50) are interconnected providing unhindered access for the mobile transport (100/200) unit to both groups of rails.

10. Vertical repeating unit according to any of the preceding claims, wherein the rows SA1 and SA2 of the first and second type of storage area are sequentially arranged and oriented parallel to each other.

11. Vertical repeating unit according to any of the preceding claims, wherein the stacked boxes in the second type of storage space are of the same dimension as for the first type of storage area

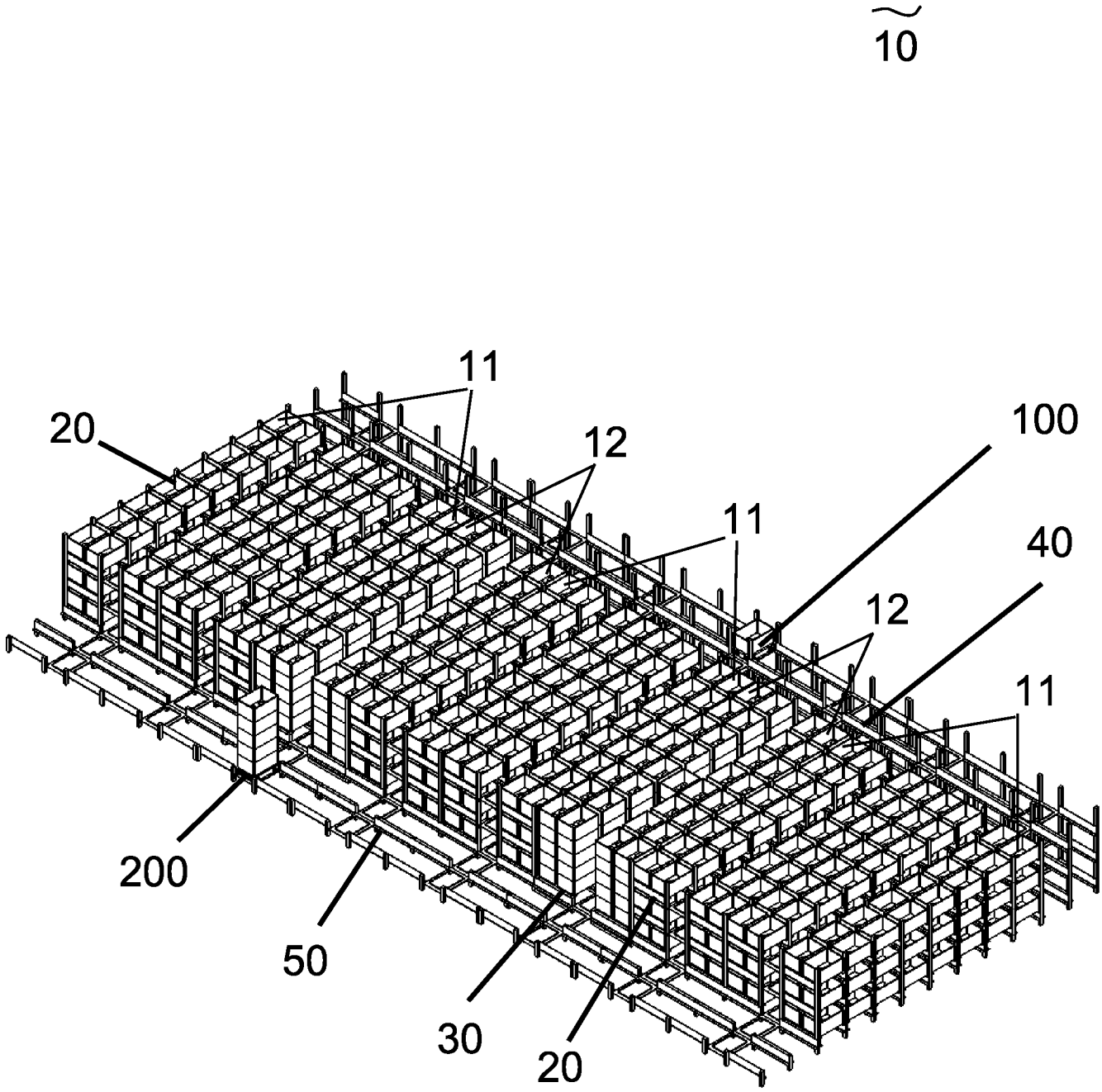

Fig.1

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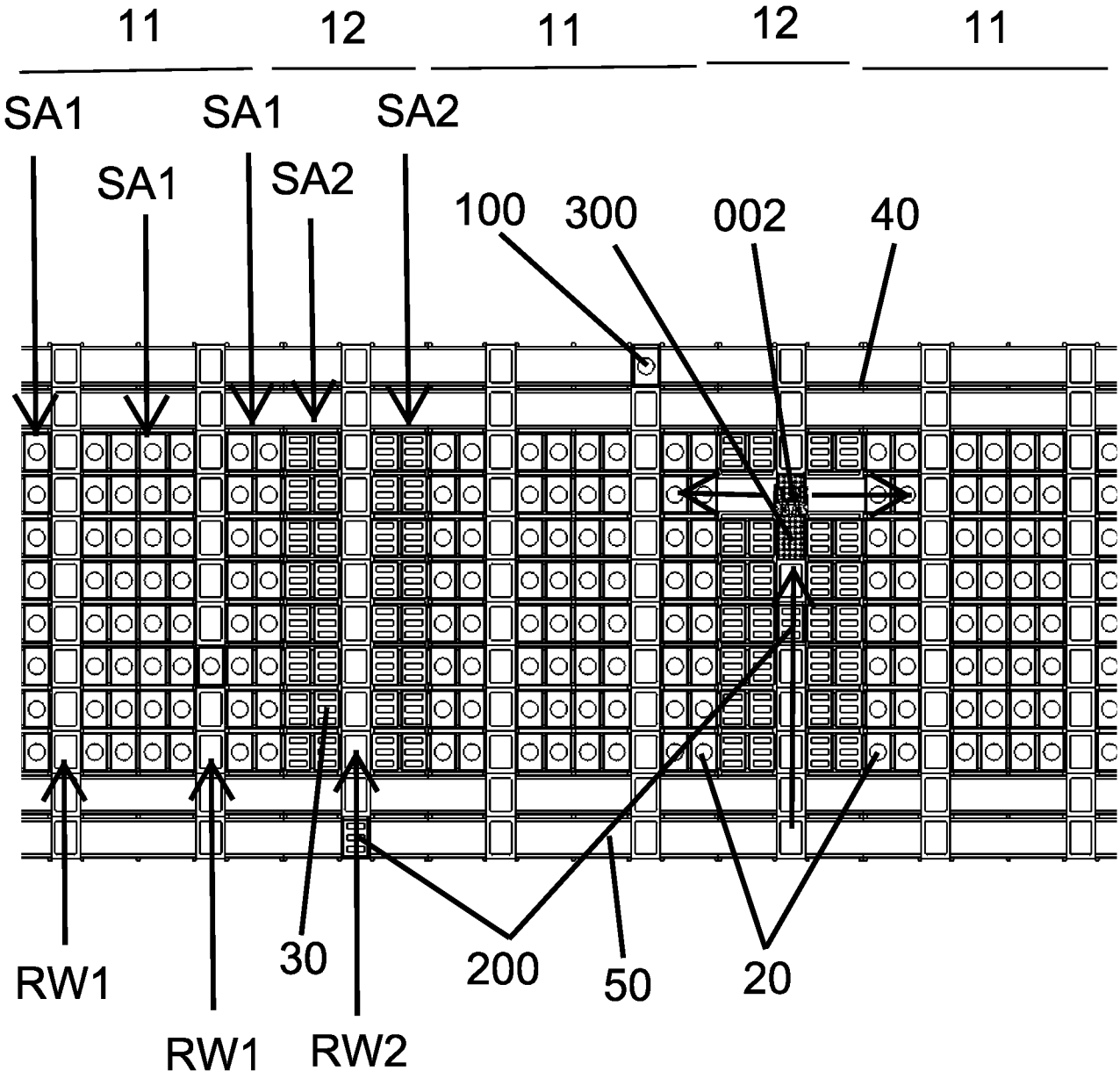
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SA1
SA1
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40
RW1
RW1
RW2
30
200
50
20

Fig.2

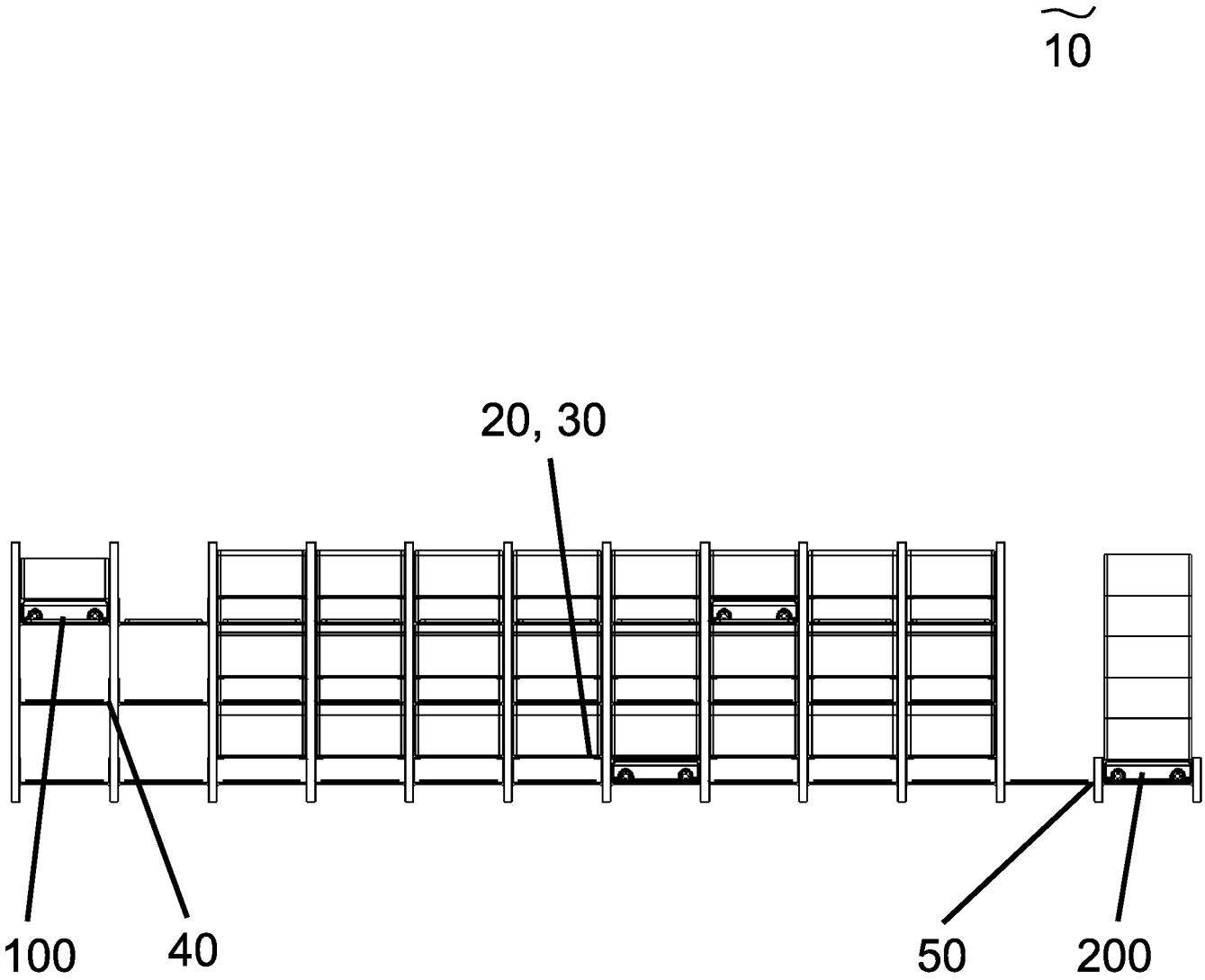


Fig.3

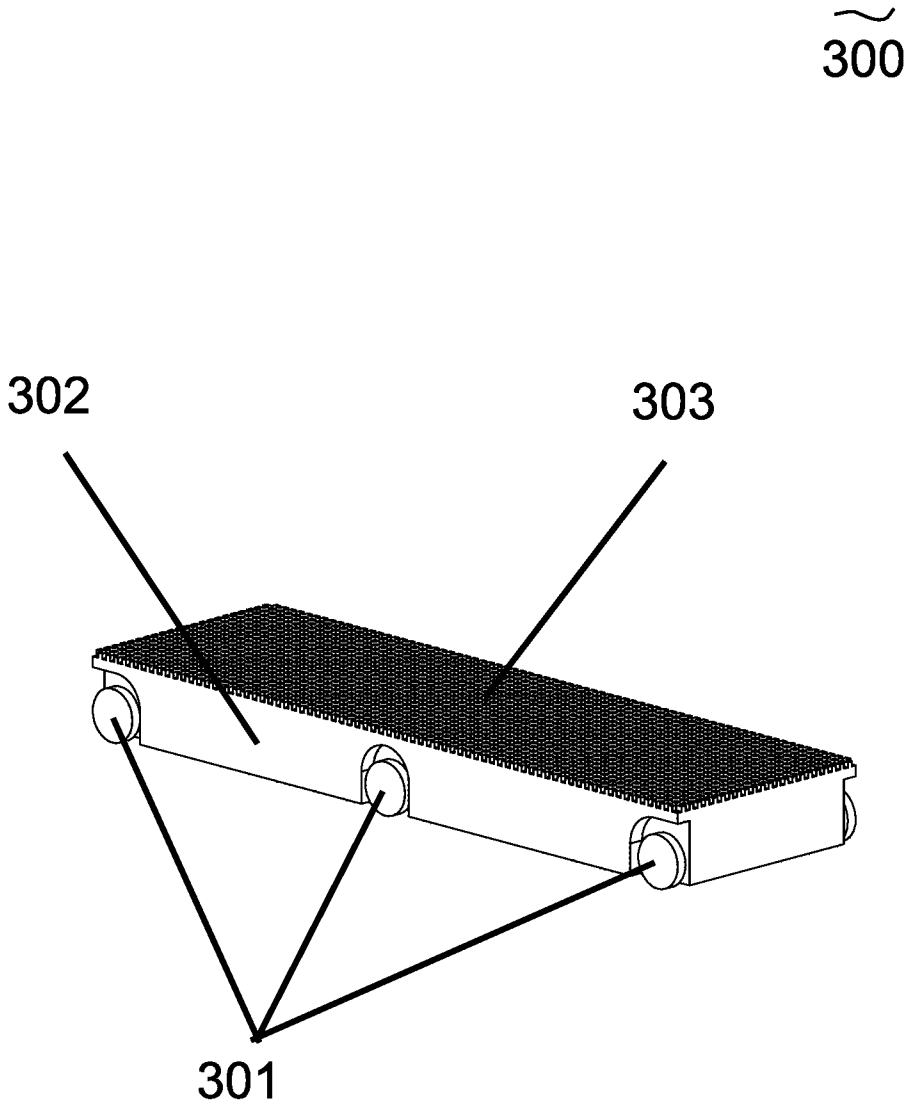
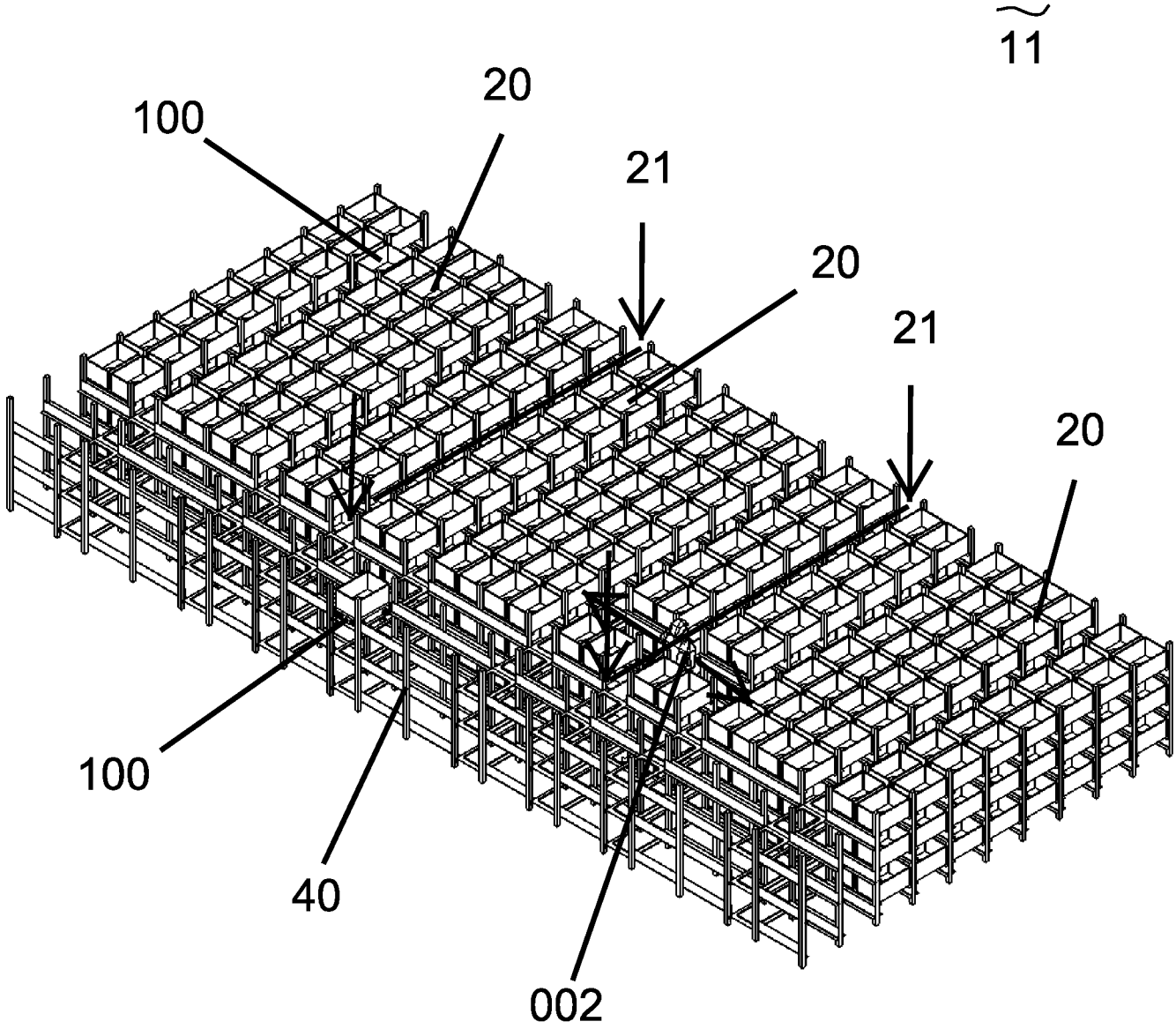
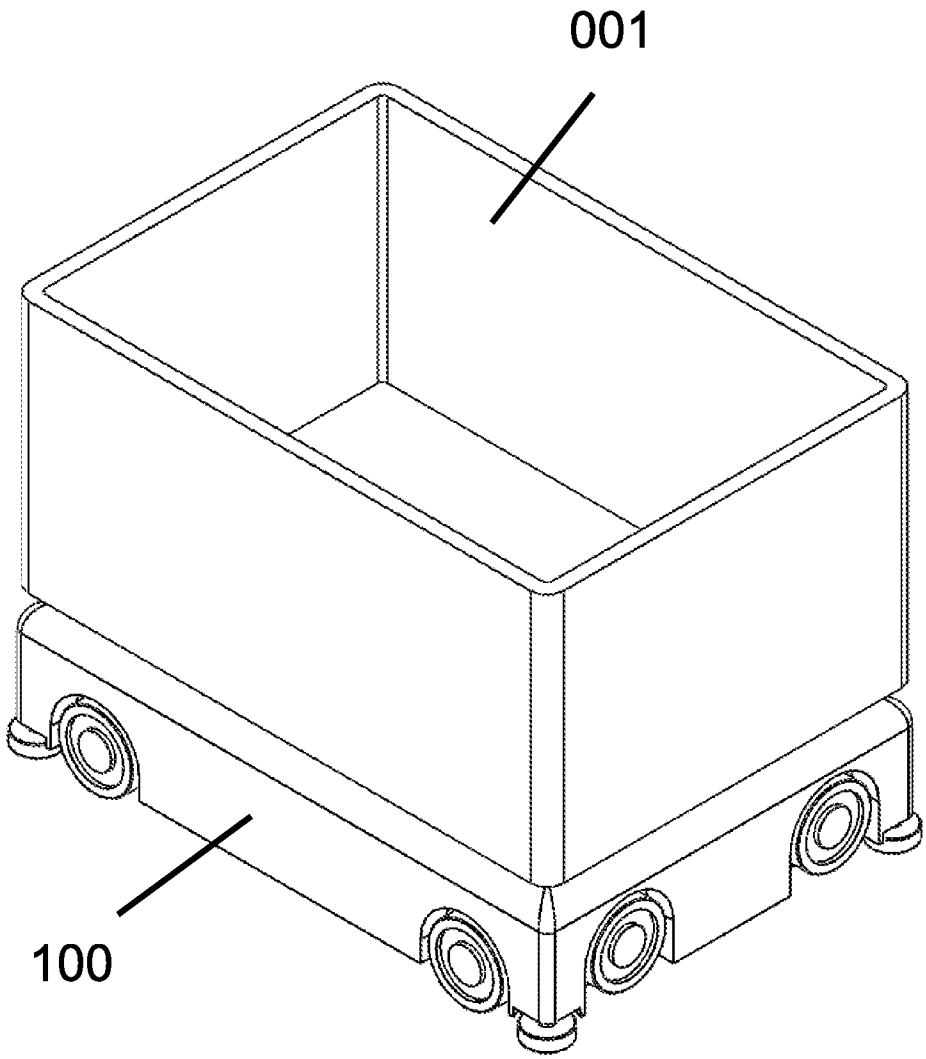


Fig.4



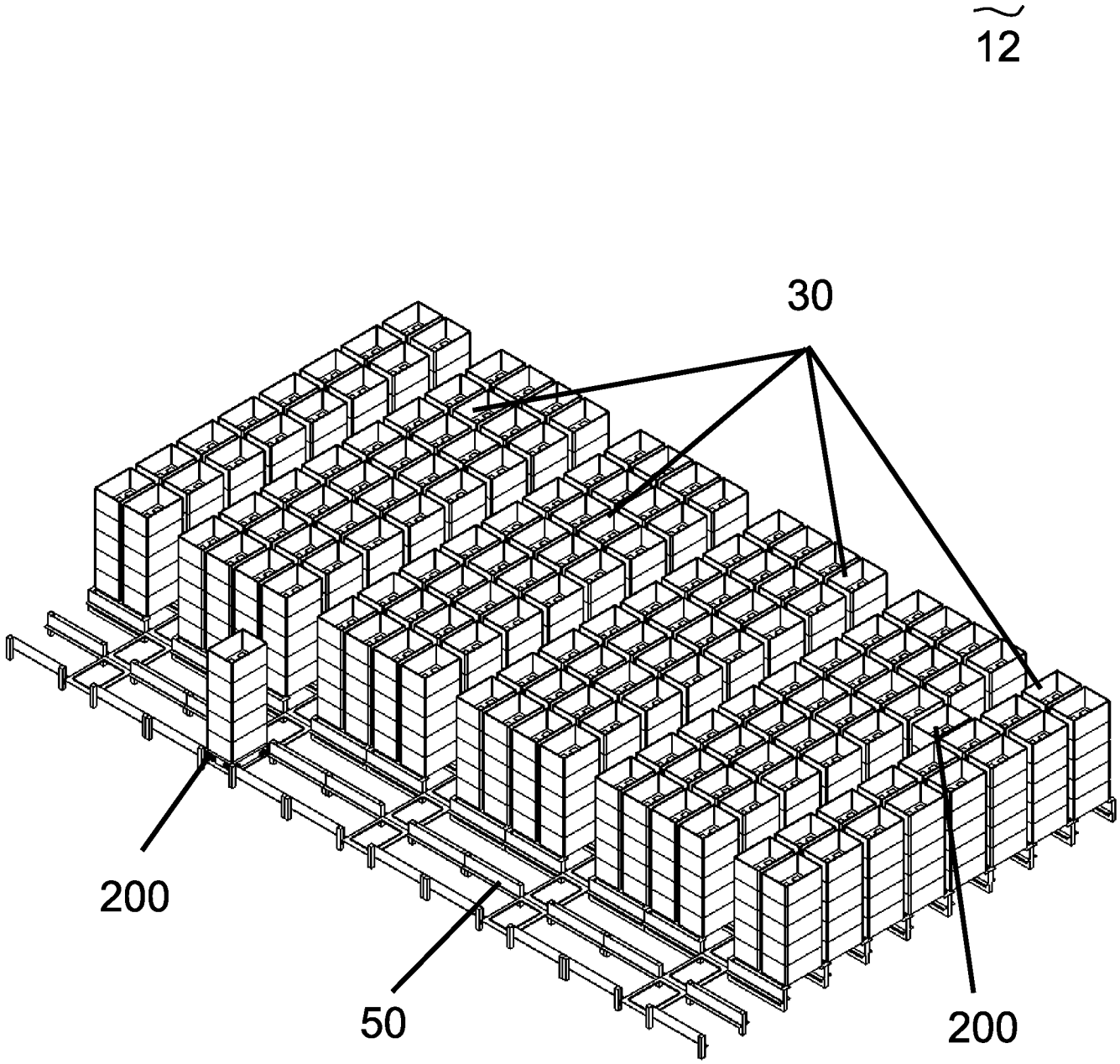
(Prior Art)

Fig.5



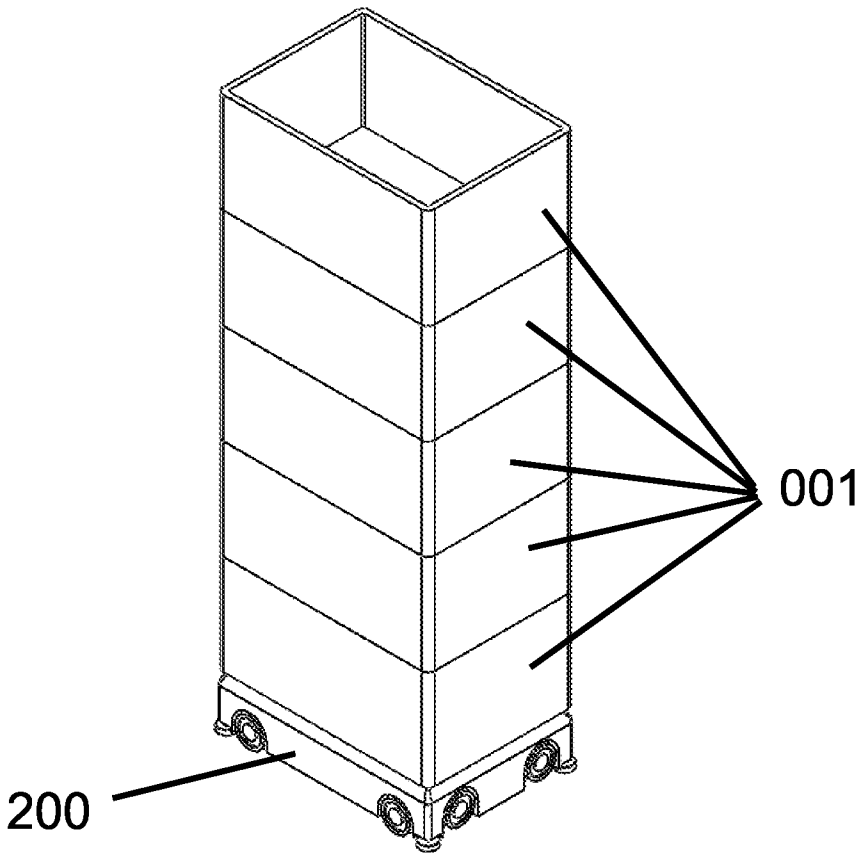
(Prior Art)

Fig.6



(Prior Art)

Fig.7



(Prior Art)

Fig.8

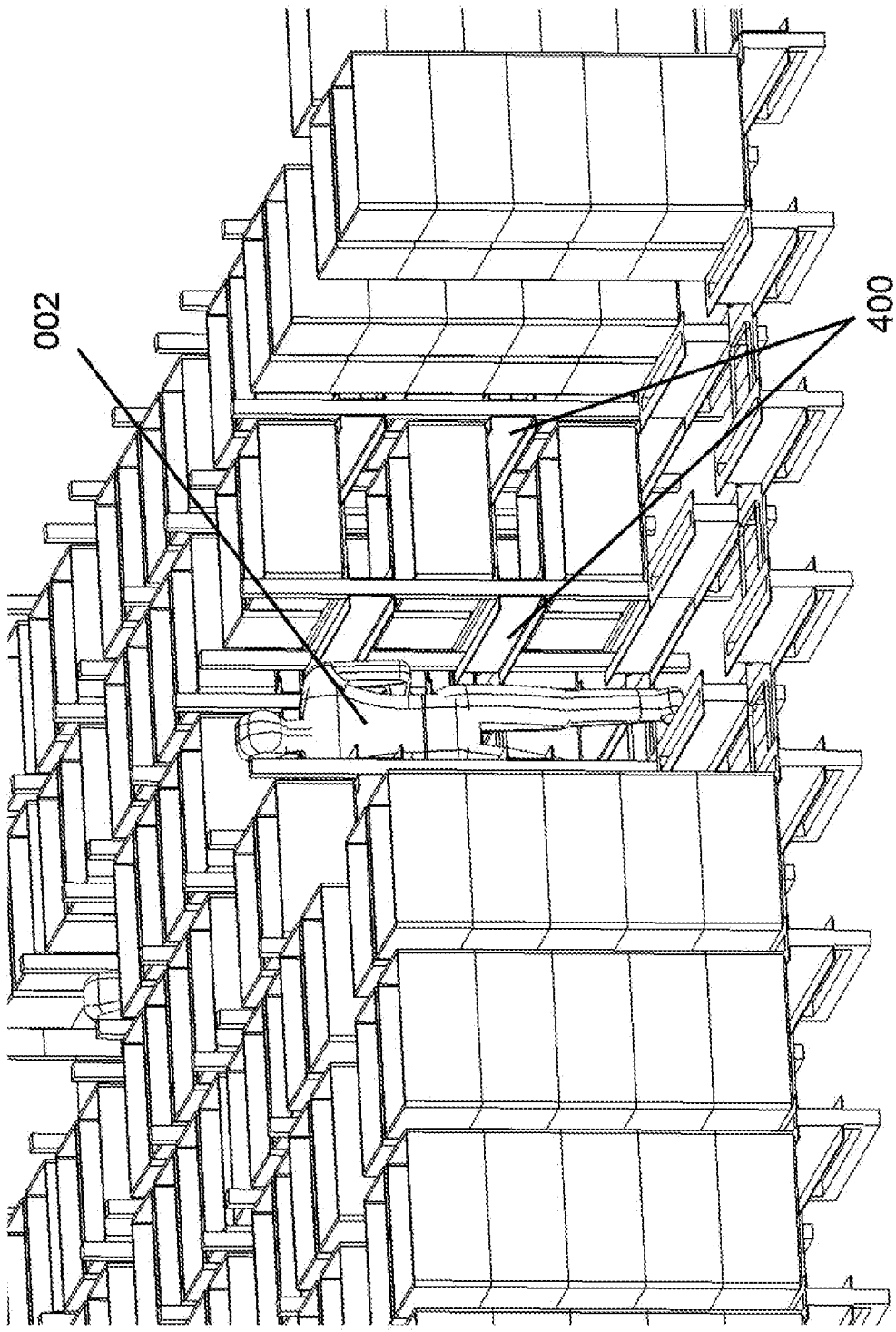


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/055449

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65G1/04
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65G

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	AT 522 334 A4 (KNAPP AG [AT]) 15 October 2020 (2020-10-15) pages 1-12; figures 1-4	1-11
Y	US 2014/086714 A1 (MALIK OHAD [IL]) 27 March 2014 (2014-03-27) pages 1-14; figures 1-29	1-11
A	EP 3 854 726 A1 (BEIJING JINGDONG QIANSHI TECH CO LTD [CN]) 28 July 2021 (2021-07-28) pages 1-6; figures 1-10	1
A	WO 2022/109452 A2 (SWISSLOG LOGISTICS INC [US]) 27 May 2022 (2022-05-27) pages 1-22; figures 1-24	1

-/--

[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
19 August 2024	29/08/2024

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Martin, Benoit

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/055449

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP H08 157016 A (MITSUBISHI HEAVY IND LTD) 18 June 1996 (1996-06-18) abstract; figures 1-15	1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2024/055449

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