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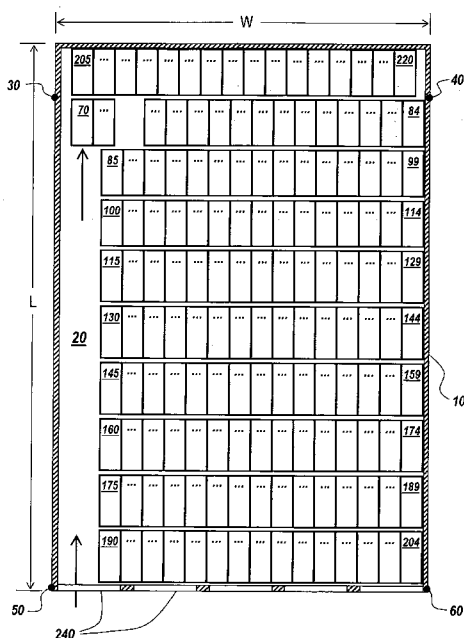


Fig. 5

(57) Abstract: A high density storage facility including a storage area is described. Storage racks may be provided in the storage facility, and may be divided from top to bottom into slots. The slots may extend the width of the racks and be accessible for inserting and removing objects into and from the racks. The racks may be disposed in rows within the storage area and include a mechanism for rolling the racks along the storage area. The storage area may include a wall disposed substantially parallel to a width-wise side of the storage area. Doors may be disposed along the length of the wall, for providing access to the width ends of the racks. The racks may be installed upon rollably movable carriages along the width of the storage area for providing access to the width ends of the carriage racks from the doors.

HIGH DENSITY STORAGE FACILITY

RELATED APPLICATIONS

- [0001] This Application claims priority to Provisional Application Number 61/127346, filed on May 12, 2008, the contents of which are incorporated herein by reference.

BACKGROUND

- [0002] The present application relates to high density storage facilities, and more particularly to high density storage facilities for storing intermodal containers, boats and other large items.
- [0003] Despite advances in building materials, material handling vehicles, and techniques, there is still a need for storage facilities for large sized objects such as intermodal containers, boats, cars, furniture and the like. Such facilities should provide mechanisms for obtaining ready and efficient access to the stored objects.
- [0004] For example, conventional boat storage facilities include a large building with racks aligned along the walls and a large unoccupied floor space. This results in a large amount of unused space, as depicted in **Figure 1**.
- [0005] Container terminals for storing and retrieving intermodal containers exhibit similar problems. Conventional facilities consume large areas of valuable seaport acreage. Because conventional facilities may use numerous aisles and provide wide spaces between intermodal containers, and because such containers are generally randomly placed and widely spaced, many terminal operators have difficulty in controlling the storage, retrieval and delivery of the containers. This often results in time consuming and costly repositioning and searching operations for displaced containers.
- [0006] Therefore, a need exists for a high density storage facility which provides ready and efficient access to the space within the facility where objects may be stored.

BRIEF SUMMARY

- [0007] In one embodiment, a high density storage facility is disclosed, including a storage area. Storage racks, divided from top to bottom into storage slots, may be provided in the storage area. Optionally, the storage area may be in a building including a wall, with doors disposed along the length of the wall for providing access to the ends of the racks.
- [0008] The storage racks may be open and accessible for inserting and removing objects. The racks may be riding on movable carriages, which may be coupled and disposed in rows within the storage area, and the carriages may include a

mechanism for moving the racks. The carriage racks may further be coupled and uncoupled along the width of the enclosed storage area for providing access to the width ends of the racks from the doors. The carriage racks may be connected and disconnected along their lengthwise sides, forming rows which are rollably movable in a widthwise direction along the storage area. Tracks for rolling the carriage racks may extend along the width of the storage area. According to one embodiment, the carriages include motor mechanisms for moving the racks across a portion of the storage area.

[0009] According to one embodiment, rows of carriage racks are disposed within the storage area. For some applications, it may be useful to include as many rows of carriage racks as will fit along the width of the storage area.

[0010] The number of carriage racks may be chosen such as to leave a portion of the floor area unoccupied, of a size sufficient to provide access from optional doors to the width ends of the carriage racks upon selective movement of the rows along the width of the storage area. According to one embodiment, the doors are selectively disposed along the wall of the building so as to provide access to the unoccupied floor area upon selective movement of one or more of the carriage racks in the rows of carriage racks along the width of the storage area. The unoccupied floor area may be selected to be of such size as to accommodate manipulation of the objects within the unoccupied floor area for insertion into the slots. The unoccupied floor area may further be selected to be of such a size as to be accessible to the doors upon movement of one or more of the carriage racks in the rows of carriage racks along the width of the floor area.

[0011] The facility may include a row of stationary racks arranged along the doorless widthwise side of the storage area, the stationary racks having a certain length, width and height and being divided from top to bottom into storage slots. The slots may extend the length of the racks, and may be open and accessible from a width end for inserting and removing objects. The width ends of the racks may face the storage area.

[0012] A row of racks may include a series of spaced vertical supports interconnected by a series of spaced horizontal supports. The horizontal supports may be adjustable in position along the height of the vertical supports.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the accompanying drawings:

[0014] **Figure 1** depicts a conventional boat or other large object storage facility

[0015] **Figure 2** depicts an exemplary embodiment of a floor plan suitable for practicing the illustrative embodiments taught herein.

- [0016] **Figure 3** depicts an exemplary embodiment of a floor plan suitable for practicing the illustrative embodiments taught herein.
- [0017] **Figure 4** depicts an exemplary embodiment of a floor plan suitable for practicing the illustrative embodiments taught herein.
- [0018] **Figure 5** depicts an exemplary embodiment of a floor plan suitable for practicing the illustrative embodiments taught herein.
- [0019] **Figure 6** depicts an exemplary embodiment of a floor plan suitable for practicing the illustrative embodiments taught herein.
- [0020] **Figure 7** depicts an exemplary embodiment of a floor plan suitable for practicing the illustrative embodiments taught herein.
- [0021] **Figure 9** is a schematic view of the vertical and horizontal supports, the slots, the wheels, and the means for rolling the carriage rack along the floor.
- [0022] **Figure 10A** depicts an electromagnetic coupling system suitable for use with illustrative embodiments of the present invention.
- [0023] **Figure 10B** depicts an exemplary rack, mounted on an electromagnetic carriage suitable for use with a maglev system according to exemplary embodiments.
- [0024] **Figure 10C** depicts an exemplary rack, mounted on a wheeled carriage suitable for use with a maglev system according to exemplary embodiments.
- [0025] **Figure 11** depicts an exemplary carriage rack, mounted on a wheeled carriage suitable for use with an intermodal container according to exemplary embodiments.
- [0026] **Figure 12** depicts an exemplary overhead view of fixed racks and carriage racks configured for use with an intermodal container according to exemplary embodiments.

DETAILED DESCRIPTION

- [0027] The following description sets forth illustrative embodiments of the present invention, it being understood that other embodiments not specifically described herein are encompassed by the present invention.
- [0028] **FIGS. 2-7** show the overall floor plan of an illustrative storage **10**. In one embodiment, a floor area **110** which is defined by lines connecting points **30, 40, 50, 60** is provided. The floor area may be in the shape of a polygon, for example,

a rectangle or a square. The floor area includes a width, designated “W” in Figure 3, and a length, designated “L” in Figure 3. The direction indicated by the double-arrows associated with the width W in Figure 3 is referred to herein as the “widthwise direction,” and the direction indicated by the double arrows associated with the length L in Figure 3 is referred to herein as the “lengthwise direction.”

[0029] As depicted in **Figures 3 and 4**, an exemplary embodiment has a floor area of 275 feet by 425 feet, which allows a number of suitably placed carriage racks to be accessed. One having ordinary skill in the art will understand that the floor area may be greater or smaller than that shown, depending on the application. More or fewer carriage racks may be employed as needed. The carriage racks and the fixed racks each have a length and a width, as indicated by length “Y” **246** and width “X” **245** of fixed rack **205** in at least **Figure 3**. While the length and width have been described with relation to fixed rack **205**, each carriage rack as discussed below has a length “Y” **246** and width “X” **245**. Each fixed rack has a length and a width along the same axes defined in relation to fixed rack **205**. Likewise, each carriage rack has a length and a width along the same axes defined in relation to other carriage racks in the same row and adjacent rows. The lengthwise direction of the fixed racks and the carriage racks may correspond to the lengthwise direction of the floor area, and the widthwise direction of the rack may correspond to the widthwise direction of the floor area.

[0030] A carriage rack is a movable rack, which may include means for locomotion integrated into the frame of the carriage, or may be mounted on a movable carriage. A plurality of movable carriage racks **70-84, 85-99, 100-114, 115-129, 130-144, 145-159, 160-174, 175-189, and 190-204** are arranged as shown in rows within floor area **110**, each row including a number of individual racks. Depending on the application, as many or as few carriage racks as needed may be selected. In the illustrative embodiment depicted in **FIG. 4**, each row includes 15 carriage racks. In this illustrative embodiment, a selected width of the area **110** is filled with carriage racks, for purposes of maximum space utilization. In other embodiments, concerns other than space utilization may call for a different configuration or a different number of racks.

[0031] In the illustrative embodiment, each row of carriage racks **70-84, 84-99, 100-114, 115-129, 130-144, 145-159, 160-174, 175-189, and 190-204** is movable widthwise along the area **110**. The rows may be mounted on wheels **11** (**FIG. 8**) which are in turn mounted in tracks **12** which extend a selected width of area **110**. Alternatively, the rows may be mounted using any other system that facilitates the movement of the carriage racks, such as a magnetic levitation system, an air levitation system that allows movement of the rows of racks, or a system of wheels without a track, the system of wheels can include one or more tires. In the illustrative embodiment, wheels **11** are mounted at the bottom of both widthwise sides of each carriage rack and a series of spaced parallel tracks **12** are provided along the width of the area **110** to coincide with the direction of displacement. In some embodiments each carriage rack in each row is movable independent of

other carriage racks in the row. For example, in some embodiments carriage rack **70** moves independently of carriage racks **71-84**. In some embodiments two or more racks are coupled or formed together to move in unison. For example, in some embodiments carriage racks **70** and **71** move in unison.

- [0032] In the embodiments shown in **FIGS. 2-7**, all of the carriage racks in each row have the same length and width, although the lengths and widths of individual rows of carriage racks may vary. In that case, the widthwise disposition of wheels and complementary tracks **12** should coincide with the lengths of each individual carriage rack. The tracks may extend the width of area **110**, i.e. between the line connecting points **(30, 60)** and points **(40, 50)**. Alternatively, the tracks may extend a different distance, depending on the particular application. In some embodiments the widths **245** of individual carriage racks may vary from row to row or in a row. In some embodiments the lengths **246** of carriage racks may vary from row to row or in a row.
- [0033] Each carriage rack may be divided into slots **14** from top to bottom. In applications such as boat storage, one having ordinary skill in the art will appreciate that the total height of the slots may be determined by the facility. However, the size of the carriage racks may vary depending on the application.
- [0034] In one embodiment, the carriages and racks are a unitary structure including a series of parallel vertically oriented supports **18** connected from top to bottom by a series of parallel horizontal **19** supports. Conventional mechanisms may be provided for adjusting a horizontal support up and down along the vertical supports **18** (**FIG. 8**). For example, the mechanisms may adjust the horizontal support in increments of, for example, inches, or may adjust the horizontal support in larger or smaller increments, depending on the application. In one embodiment, the vertical distance between successive horizontal supports defines the slot height and the horizontal distance between successive vertical supports **18** defines slot width.
- [0035] According to one embodiment, a series of doors **240** are disposed along one widthwise wall of the facility. An unoccupied and changeable service and loading area **20** may be provided, the size of which may be selected based on a number of factors. Such factors may include where doors **240** are disposed along the outer wall.
- [0036] When carriage racks in a row **70-84, 85-99,100-114,115-129,130-144,145-159,160-174,175-189, and 190-204** are appropriately moved along the floor area **110**, enough floor area **20** may be left unoccupied so as to enable the user to gain access to the width ends **245** of each row. As shown in **FIGS. 3 -8**, the unoccupied floor area **20** may be large enough relative to the displacement of doors **240** so as to enable a user of the facility to gain access to the width ends **245** of the carriage racks. This can be accomplished by moving one or more carriage racks sufficiently to enable a user to gain access to the width ends **245** of racks in a row through a door **240**. Objects to be stored in the slots may be

inserted via the width ends **245** of the carriage racks. In some embodiments, objects to be stored in the slots may be inserted via the length wise opening **246** of the carriage racks.

- [0037] As shown in **FIGS. 2-7**, a stationary row of racks **205-220** along the doorless widthwise wall may be provided. This may allow for greater storage utilization in the facility. The width ends **245** of racks **205-220** may also be accessible through at least one door **240** by appropriate movement of carriage racks in rows **70-84, 85-99, 100-114, 115-129, 130-144, 145-159, 160-174, 175-189, and 190-204** of carriage racks along the width of area **10**.
- [0038] The size of the unoccupied floor area **20** may be selected such that it is large enough to allow the objects to be stored in the carriage racks and to be manipulated into the width ends **245** of the carriage racks. For example, the length and width of the unoccupied floor space **20** may be selected to be long enough and wide enough to enable a forklift to align itself parallel to the length of the carriage racks for insertion and removal of the boat(s) into and from the width ends **245** of the carriage racks. Likewise, the size of the unoccupied floor area **20** may be selected such that it is large enough to allow the objects to be stored in the carriage racks and to be manipulated into the length wise opening **246** of the carriage racks. For example, the length and width of the unoccupied floor space **20** may be selected to be long enough and wide enough to enable a forklift to align itself perpendicular to the length of the carriage racks for insertion and removal of an intermodal container from the length wise opening **246** of the carriage racks.
- [0039] **Figure 4** depicts unoccupied floor space **20** at the far left of the floor area **110**. This configuration may facilitate, for example, access to the width end **245** of rack **220**. However, with reference to **Figure 5**, a user may desire to gain access to the width end **245** of carriage rack **104** to remove an object from the rack. According to one embodiment of the present invention, appropriate carriage racks may be shifted in a widthwise direction with respect to the floor area **110**, as depicted in Figures 5-6. In **Figure 6**, the appropriate carriage racks have been shifted such that unoccupied floor space **20** provides a passage to the width end **245** of carriage rack **104**, allowing access to carriage rack **104**, for example, by a forklift. In **Figure 7**, the carriage racks have been further shifted to provide a passage via unoccupied floor space **20** to the width end **245** of carriage rack **136**. Similarly, in **Figure 8**, appropriate carriage racks have been shifted in order to provide access via unoccupied floor space **20** from the door to the width end of carriage rack **167**.
- [0040] In one embodiment, the lengths and widths of movable carriage racks **70-84, 85-99, 100-114, 115-129, 130-144, 145-159, 160-174, 175-189 and 190-204** may vary among different movable rows provided within a facility **110**. The facility **110** may be provided with an unoccupied area **20** of at least a size sufficient to obtain access through an appropriate door **240** to all of the width ends **245** of the carriage racks. This may be accomplished, for example, upon appropriate

widthwise movement of successive rows of carriage racks within a floor area defined by lines between points **30, 40, 50, and 60**. The facility **10** may be provided with a stationary row of racks **205-220**. These stationary racks may also have varying widths, or may be of the same width, and may be located along a doorless wall. The movable carriage racks **70-84, 85-99, 100-114, 115-129, 130-144, 145-159, 160-174, 175-189, and 190-204** may be aligned such that their lengthwise dimensions are substantially parallel to the lengthwise dimension of area **110**.

- [0041] In some embodiments, it may be necessary or desirable to access the length ends of the carriage racks. For example, intermodal containers may be stored in the racks which must be lifted, for example by a forklift, from the length ends. Accordingly, the racks may be oriented so as to afford access to the length ends from the doors.
- [0042] **FIG. 9** depicts a schematic front view of illustrative coupled racks. The racks may be divided into slots **14** by vertical supports **18** and by horizontal supports **19**. A row of carriage racks may extend across the width of a selected defined floor space (*e.g.* between points **30, 60 and 40, 50**), or may extend across any width that is appropriate to the particular application. The movable coupled racks may be mounted on rollable wheels **11** which, in turn, may be mounted within complementary tracks **12** provided on the floor surface.
- [0043] The racks may alternatively be mounted on carriages. For example, **Figure 10B** depicts an exemplary rack, mounted on an electromagnetic carriage suitable for use with a maglev system according to exemplary embodiments of the present invention. **Figure 10C** depicts an exemplary rack, mounted on a wheeled carriage suitable for use with a maglev system according to exemplary embodiments of the present invention.
- [0044] The carriage racks may be coupled along the lengthwise side, the widthwise side, or both. The carriage racks may be coupled using any suitable coupling method, such as by an electromagnetic coupling system, an electromotive coupling system, or a mechanical coupling system such as a system of hooks. For example, **Figure 10A** depicts an electromagnetic coupling system suitable for use with illustrative embodiments of the present invention.
- [0045] In one embodiment, the rows of fixed racks **205-220** may be aligned such that their width ends **245** face the widthwise side of area **110** and are substantially parallel thereto. The stationary racks may be smaller, lengthwise or widthwise or both, than the movable racks for purposes of ease of loading, unloading and storage of smaller objects. Alternatively, the stationary racks may be of the same size as the movable carriage racks, or larger, depending on the application.
- [0046] In one embodiment, motor means may be provided to drive the movable carriage racks in the rows of carriage racks along the lengths of area **110**. Remote control means for the motor means may be provided for access to the user outside of area

110. These remote control means may be outside, such as on the outside surfaces of the walls in which access doors **240** are disposed. The user can thus drivably move the carriage racks remotely from outside areas **20, 110**. Alternatively, the remote control means may be located inside, as appropriate to the application. The motor means may also be controlled locally.

- [0047] **Fig. 11** depicts exemplary carriage rack **1100**, mounted on a wheeled carriage **1110** suitable for use with an intermodal container **1112** according to exemplary embodiments. The carriage rack **1100** includes four slots **1114-1118**. Each slot is accessible from the length wise opening **246**. In this embodiment the carriage racks **1100-1104** move in a length wise direction with respect to the length “L” of floor area **110**. In this embodiment, the tracks **12** extend in a length wise direction parallel to the length “L” of floor area **110**. Placement of an intermodal container into one of the slots of the carriage rack **1100** occurs from the length wise opening **246**. Likewise, removal of an intermodal container into one of the slots of the carriage rack **1100** occurs from the length wise opening **246**.
- [0048] **Fig. 12** depicts exemplary overhead view of a plurality of carriage racks **1100**, mounted on a wheeled carriages **1110** suitable for use with an intermodal container **1112** according to exemplary embodiments. As exemplary depicted the carriage racks **1100** move in a length wise direction “L” to define area **20**, which, in turn provides access and egress to a selected one of the carriage racks **1100**. The carriage racks **1100** may move individually. In some embodiments, two or more of the carriage racks **1100** are coupled to move in unison, but can be decoupled to move an individual one of the carriage racks **1100**.
- [0049] As discussed above in relation to other embodiments, the carriage racks depicted in Figures 11 and 12, may be electromagnetically coupled and decoupled along a width wise dimension **245** or mechanically coupled and decoupled along a width wise dimension **245**.
- [0050] The individual carriage racks in a row of carriage racks may be separately drivable, and the remote motor control may be provided with means for separately driving carriage racks in each row independent of carriage racks in another row. When the user wants to gain access to any particular movable row or stationary rack, the user can separately drive individual carriage racks and rows to move them to appropriate positions within area **110**, whereby access to desired racks can be obtained. In one embodiment, the user can gain such access by remote control.
- [0051] In embodiments where a facility according to the invention is to be used for boat storage, area **20** may serve multiple purposes, such as loading/unloading, servicing a boat or other object, cleaning, and repair.

[0052] In some embodiments, the storage facility may be fully or partially enclosed. The facility may or may not include a roof.

[0053] It will be apparent to those skilled in the art that other embodiments, improvements details and uses can be made consistent with the letter and spirit of the foregoing disclosure and within the scope of this patent.

What is claimed is:

1. A high density storage facility comprising:
a floor area of a certain length and width;
a plurality of rollably movable storage racks of certain height divided from top to bottom into storage slots, the slots extending the length of the carriage racks and being open and accessible for inserting and removing objects into and from the width ends of the carriage racks, the carriage racks being disposed within the floor area and including means for moving the carriage racks along the floor in a direction consistent with the width of the floor area, said carriage racks arranged in rows within the floor area with the lengthwise sides of the carriage racks being arranged substantially parallel to the lengthwise sides of the floor area, said rows comprising a plurality of side by side carriage racks which collectively fit within and across the width of the floor area.
2. The facility of claim 1 further comprising motor means for drivably moving the carriage racks across the width of the floor area.
3. The facility of claim 1 wherein the floor area is enclosed.
4. The facility of claim 1 further comprising a wall disposed substantially parallel to a widthwise side of the floor area, the wall including door means selectively disposed along the length of the wall for providing access to the width ends of all of the carriage racks, the carriage racks being moveable along the width of the enclosed floor area for providing access to the width ends of the racks from the door means.
5. The facility of claim 1 further comprising a row of stationary racks arranged along the widthwise side of the floor area, the stationary racks having a certain length, width and height and being divided from top to bottom into storage slots, the slots extending the length of the racks and being open and accessible from one width end for inserting and removing objects into and from the width ends of the stationary racks, the width ends of the racks facing the floor area.
6. The facility of claim 1, wherein the carriage racks are uncoupably coupled along the width of the floor area for providing access to the width ends of the carriage racks.
7. The facility of claim 5 wherein at least two rows of carriage racks are disposed within the floor area and wherein as many rows of carriage racks are disposed within the floor area as will fit along the width of the floor area and leave a portion of the floor area unoccupied which is of a size at least sufficient to provide access to the width ends of the carriage racks upon selective movement of carriage racks in the rows of carriage racks along the width of the floor.
8. The facility of claim 7 wherein door means are selectively disposed along a widthwise wall of the facility so as to provide access to the unoccupied floor area upon selective movement of one or more of the carriage racks in the rows of carriage racks along the length of the floor area

9. The facility of claim 7 wherein the unoccupied floor area is further selected to be of such a size as to accommodate manipulation of the objects within the unoccupied floor area for insertion into the slots.
10. The facility of claim 1 wherein the carriage racks are mounted on tracks for widthwise movement within the floor area, the tracks extending the width of the floor area in a direction substantially parallel to the widthwise side of the floor area.
11. The facility of claim 5 further comprising motor means for drivably moving the carriage racks across the width of the floor area.
12. The facility of claim 5 wherein at least two rows of carriage racks are disposed within the floor area and wherein as many rows of carriage racks are disposed within the floor area as will fit along the width of the floor area and leave a portion of the floor area unoccupied which is of a size at least sufficient to provide access to the width ends of the carriage racks upon selective movement of the carriage racks in the rows of carriage racks along the width of the floor.
13. The facility of claim 9 wherein door means are selectively disposed along the widthwise wall of the building so as to provide access to the unoccupied floor area upon selective movement of one or more of the carriage racks in the rows of carriage racks along the width of the floor.
14. The facility of claim 9 wherein the unoccupied floor area is further selected to be of such a size as to be accessible upon movement of one or more of the carriage racks in the rows of carriage racks along the width of the floor area.
15. The facility of claim 1 wherein the carriage racks comprising a row are connected electromagnetically along their lengthwise sides forming rows which are movable and selectively disconnected or uncoupled in a widthwise direction along the floor area
16. The facility of claim 4 further comprising motor means for drivably moving the carriage racks in the rows of carriage racks across the width of the floor area.
17. The facility of claim 4 further comprising a row of stationary racks arranged along the widthwise side of the floor area, the stationary racks having a certain length, width and height and being divided from top to bottom into storage slots, the slots extending the length of the racks and being open and accessible from one width end for inserting and removing objects into and from the width ends of the stationary racks, the width ends of the racks facing the floor area.
18. The facility of claim 4 wherein a rack in a row of racks comprises a series of spaced vertical supports interconnected by a series of spaced horizontal supports.
19. The facility of claim 15 wherein the carriage racks in a row of carriage racks are mounted on tracks for widthwise movement within the floor area, the tracks extending the width of the floor area in a direction substantially parallel to the widthwise side of the floor area.
20. The facility of claim 6 wherein a carriage rack in a row of carriage racks comprises a

series of spaced vertical supports interconnected by a series of horizontal supports.

21. The facility of claim 4 wherein at least two rows of carriage racks are disposed within the floor area and wherein as many rows of carriage racks are disposed within the floor area as will fit along the width of the floor area and leave a portion of the floor area unoccupied which is of a size at least sufficient to provide access from the door means to the width ends of the carriage racks upon selective movement of the carriage racks in the rows of carriage racks along the width of the floor.

22. The facility of claim 8 wherein door means are selectively disposed along the wall of the building so as to provide access to the unoccupied floor area upon selective movement of one or more carriage racks in the rows of carriage racks along the length of the floor area.

23. The facility of claim 8 wherein the carriage racks in a row of carriage racks comprises a series of spaced vertical supports interconnected by a series of spaced horizontal supports.

24. The facility of claim 8 wherein the unoccupied floor area is further selected to be of such a size as to be accessible upon movement of one or more of the carriage racks in the rows of carriage racks along the width of the floor area.

25. The facility of claim 14 further comprising motor means for drivably moving the carriage racks across the width of the floor area.

26. The facility of claim 14 wherein a carriage rack in a row of carriage racks comprises a series of spaced vertical supports interconnected by a series of spaced horizontal supports.

27. The facility of claim 14 further comprising a row of stationary racks arranged along one or both of the lengthwise sides of the floor area, the stationary racks having a certain length, wherein objects can be placed into and taken from the width ends of the stationary racks, the width ends of the racks facing the floor area.

28. The facility of claim 24 wherein a carriage rack in a row of carriage racks comprises a series of spaced vertical supports interconnected by a series of spaced horizontal supports.

29. A high density boat storage facility comprising:
a floor area of certain length and width;
a plurality of rollable movable storage racks of certain height divided from top to bottom into storage slots, the slots extending the length of the racks and being open and accessible for inserting and removing boats into and from the width ends of the carriage racks, the carriage racks being disposed in rows within the enclosed floor area and including means for rolling the carriage racks along the widthwise direction of the floor area.

30. The facility of claim 29, wherein the floor area is enclosed.

31. The facility of claim 29, further comprising a wall disposed substantially parallel to a widthwise side of the floor area, the wall including door means selectively disposed along a

widthwise wall for providing access to the width ends of the carriage racks, the carriage racks being rollably moveable along the width of the enclosed floor area for providing access to the width ends of the carriage racks from the door means.

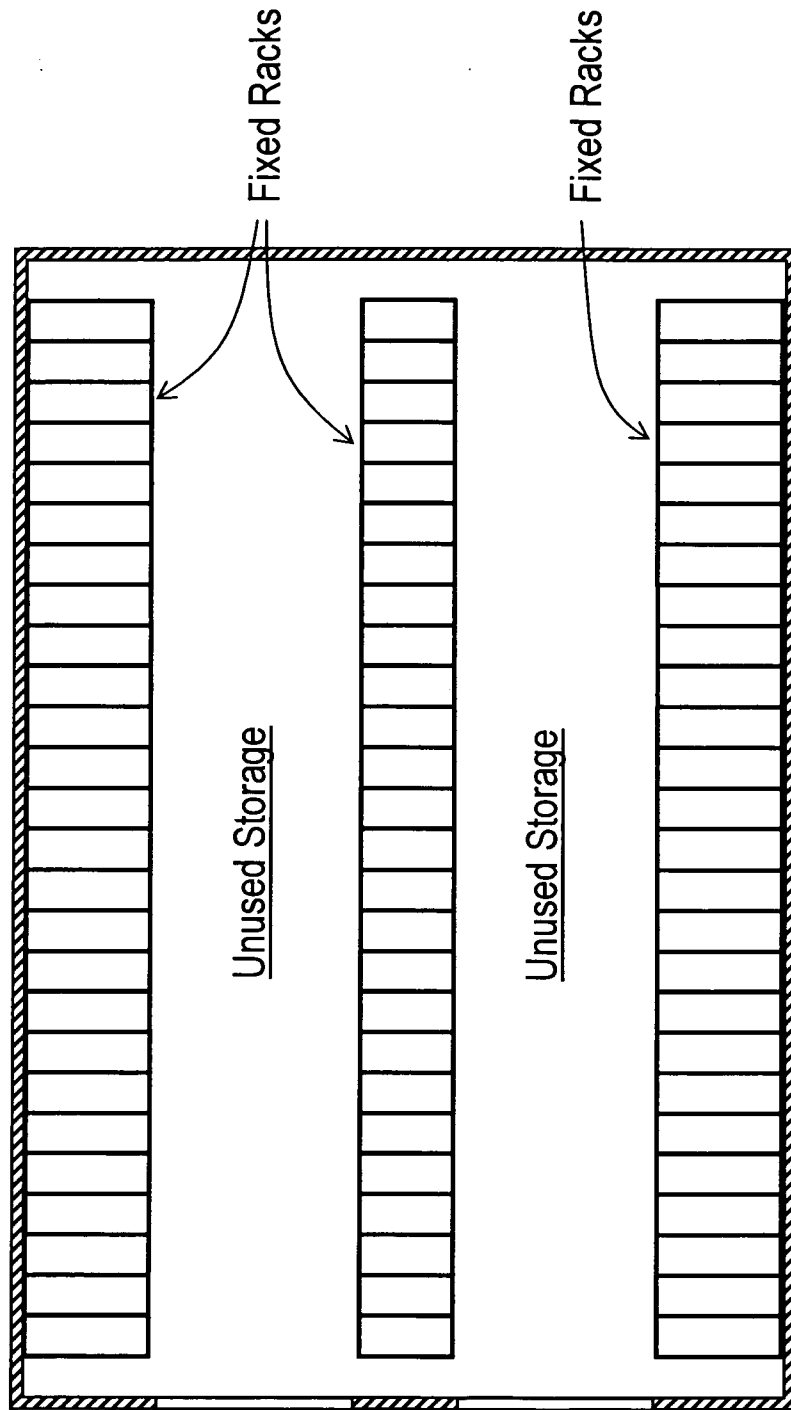


Fig. 1
(Prior Art)

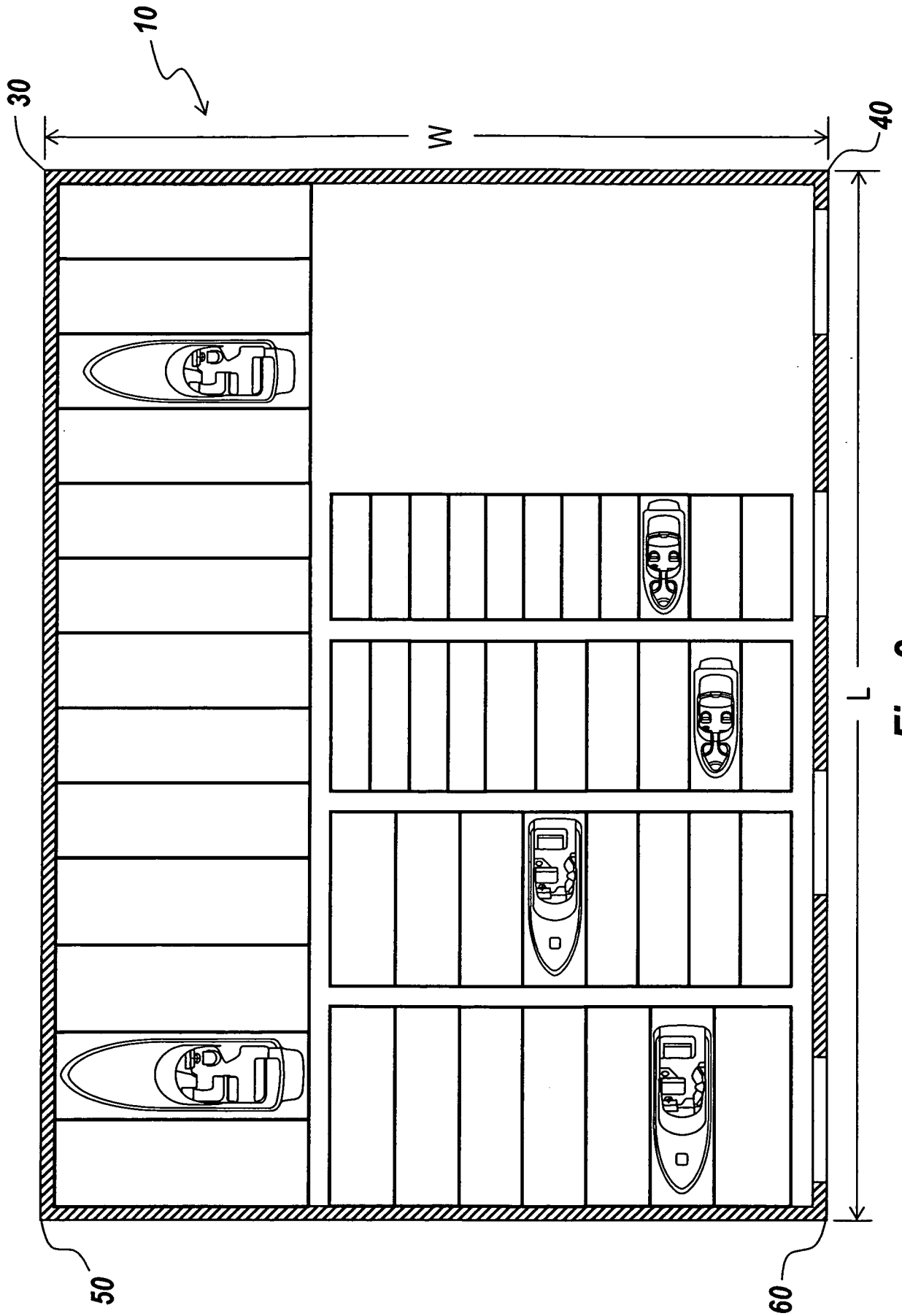


Fig. 2

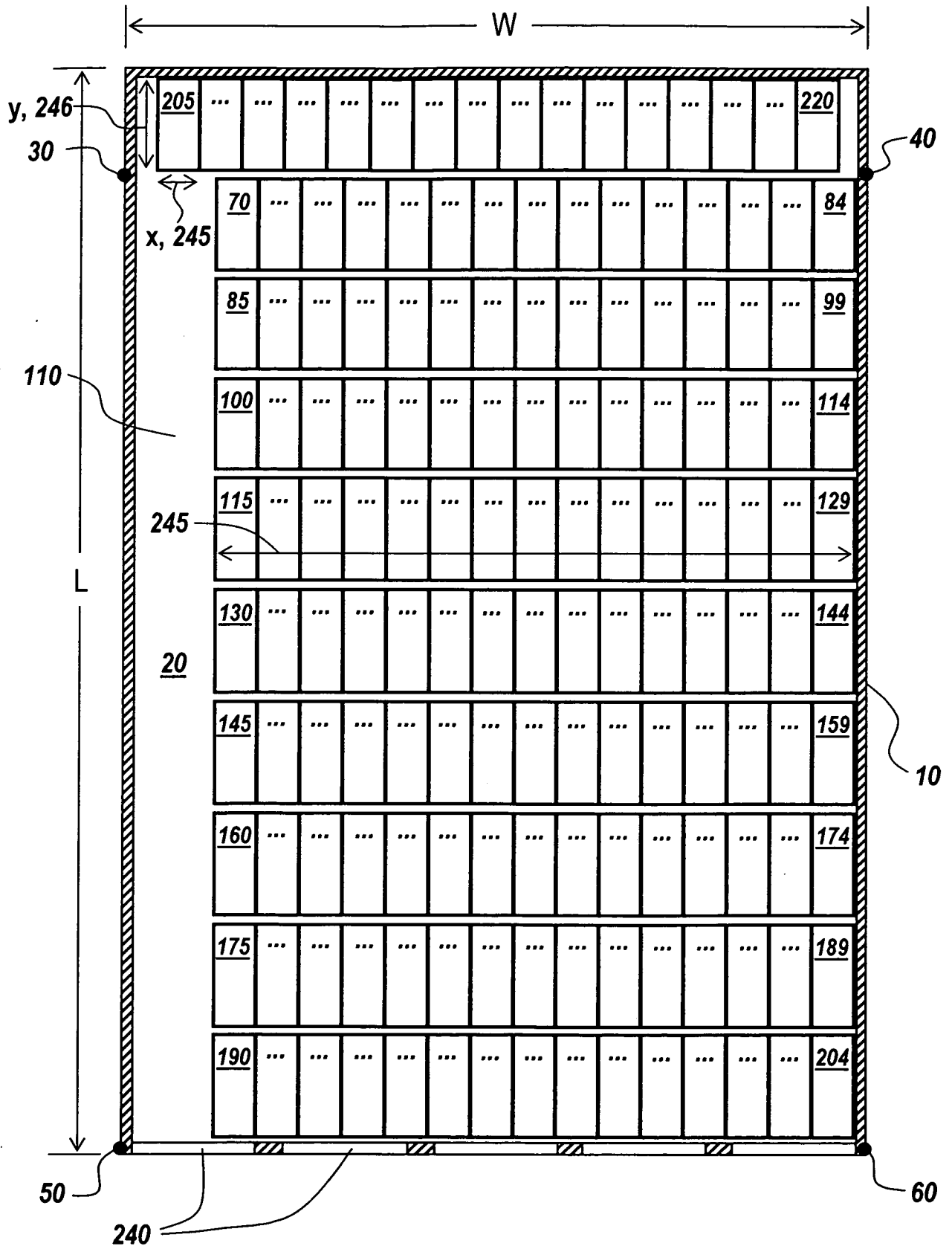


Fig. 3

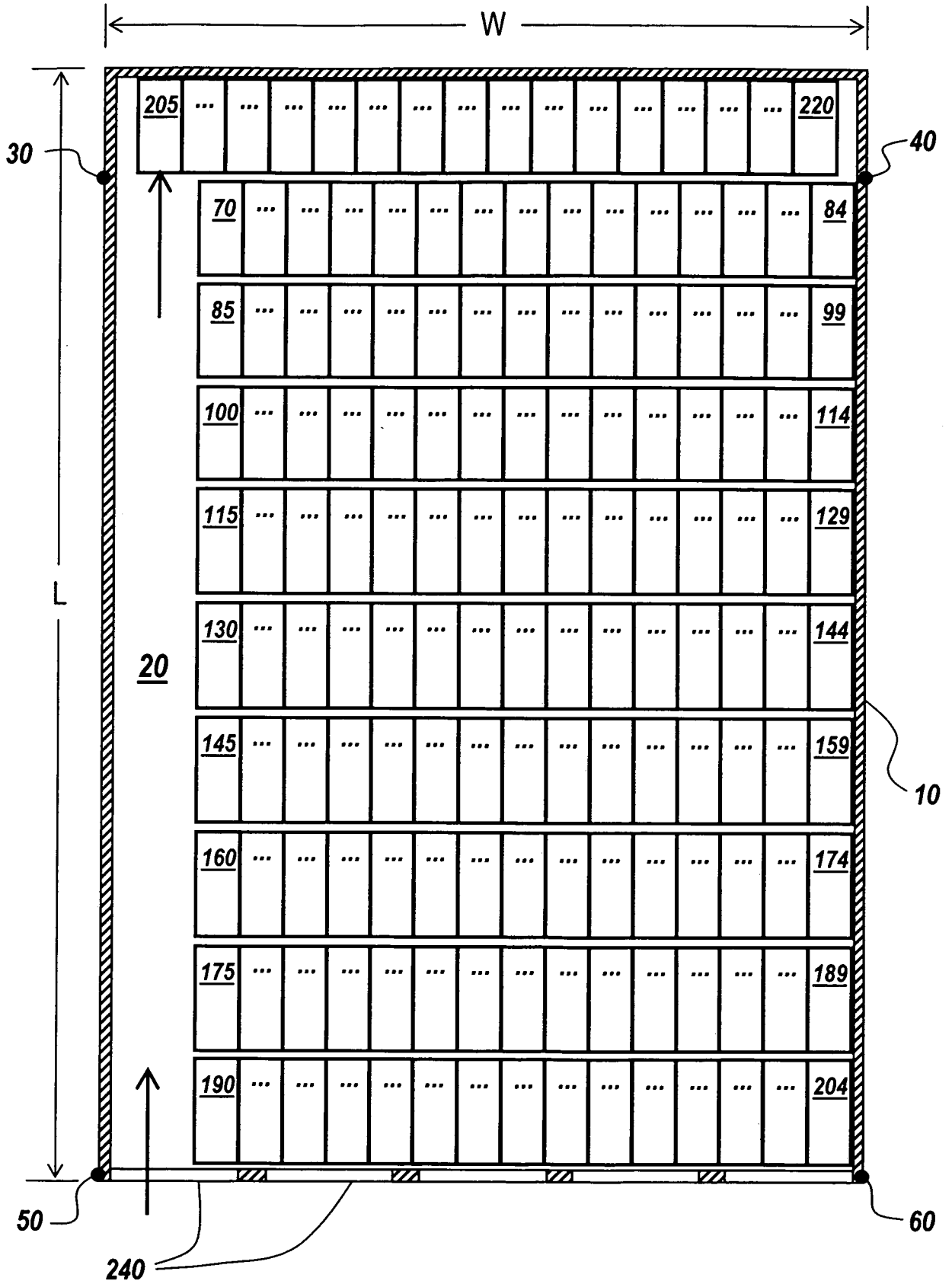


Fig. 4

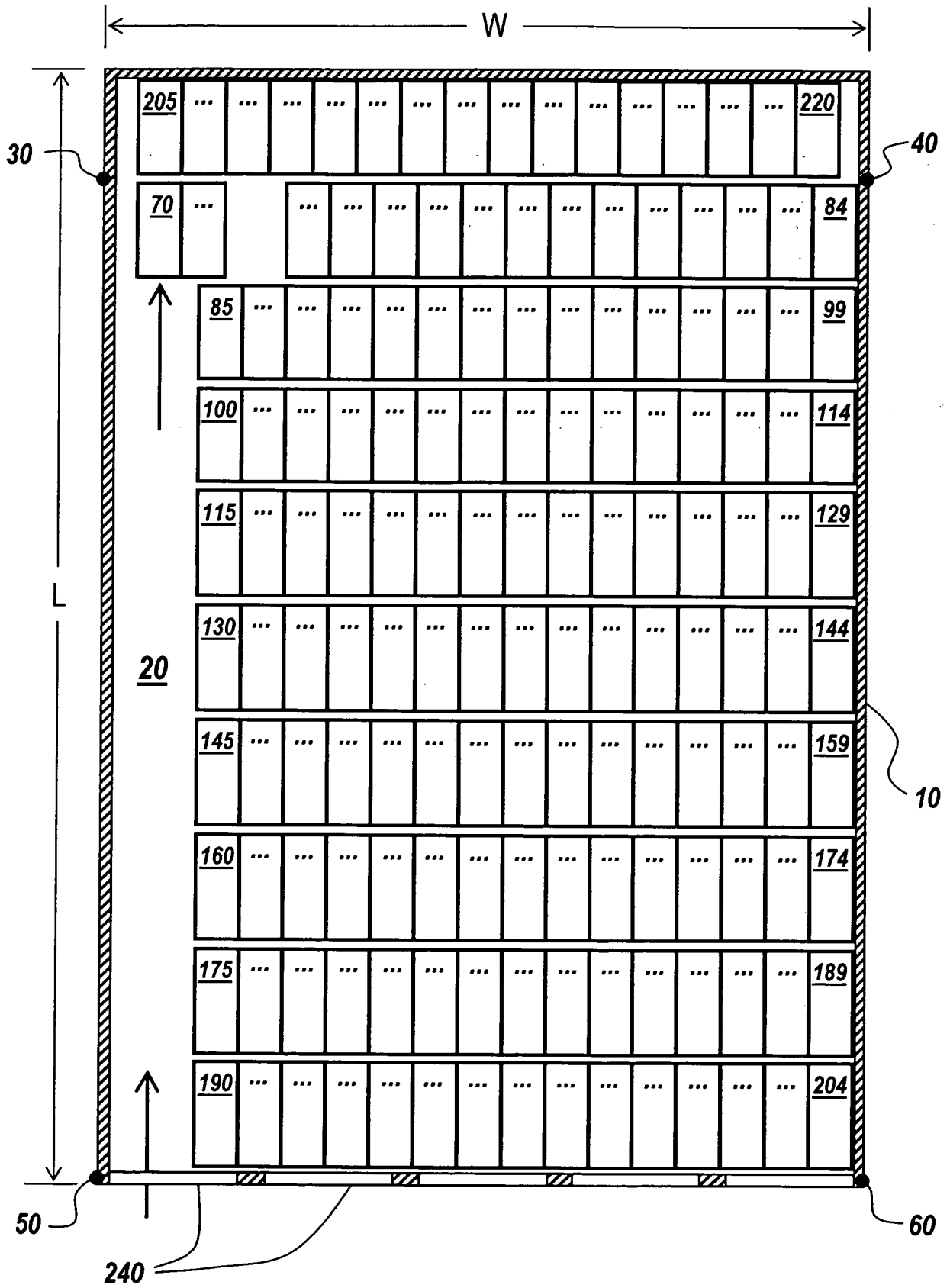


Fig. 5

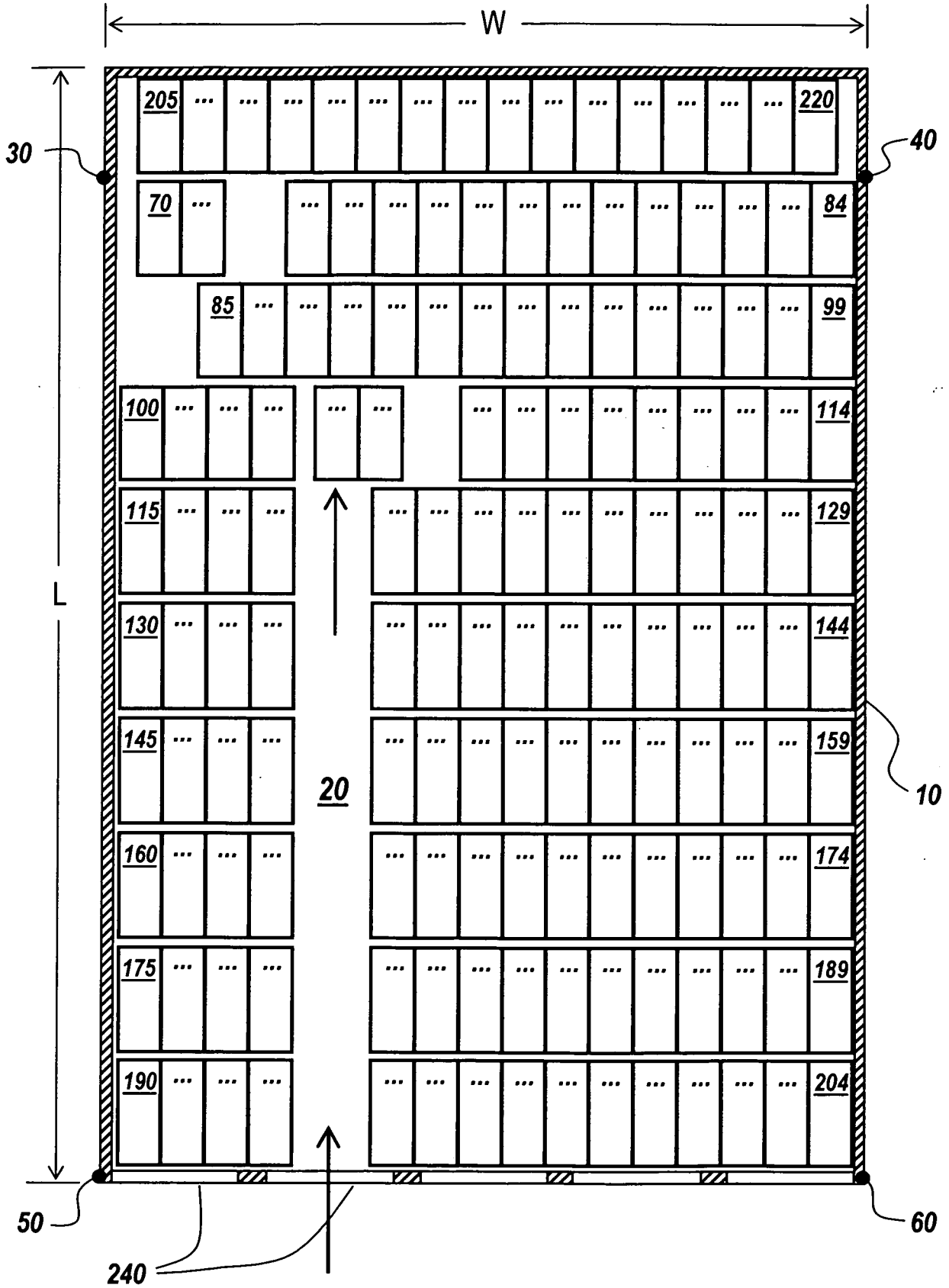


Fig. 6

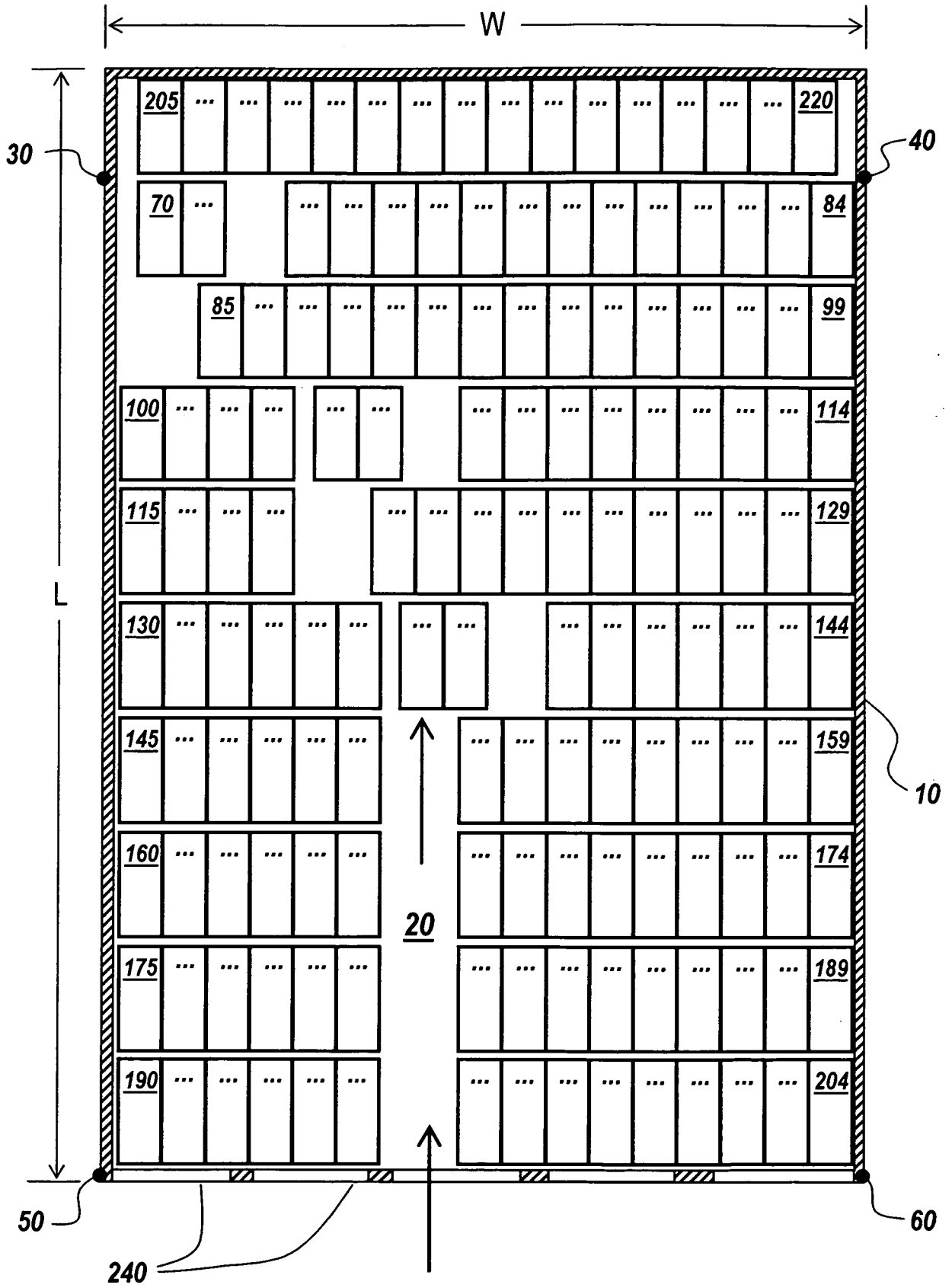


Fig. 7

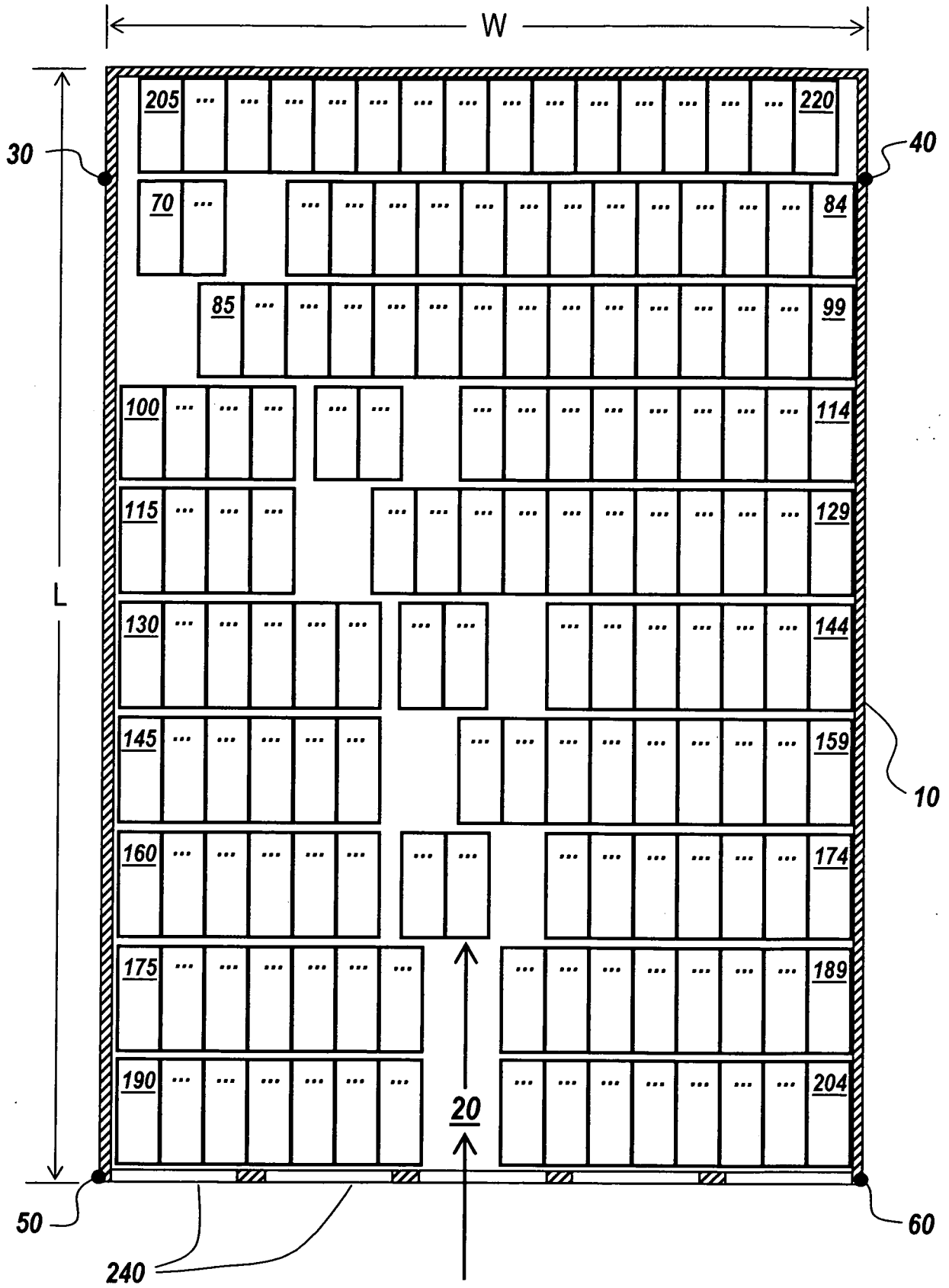


Fig. 8

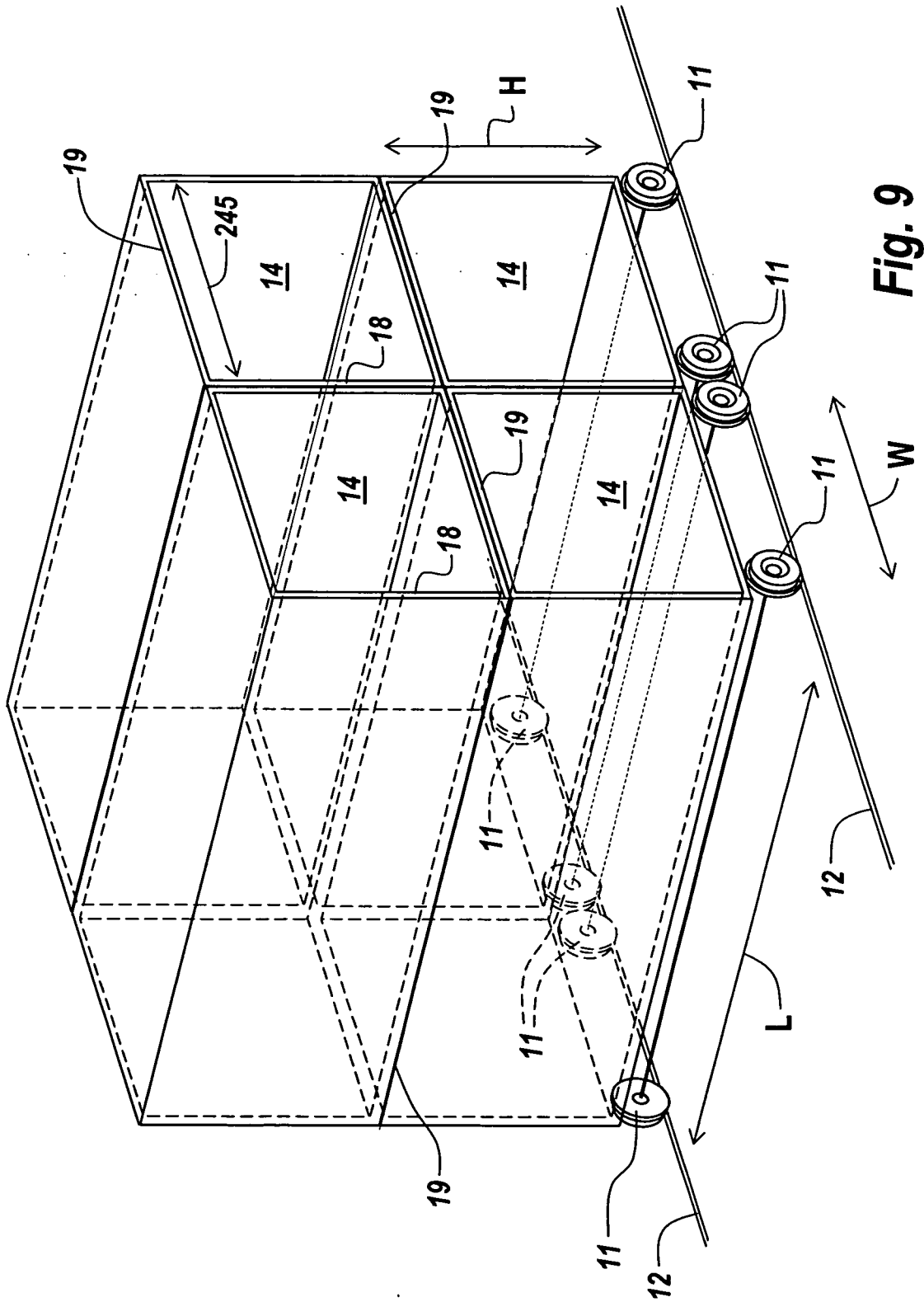


Fig. 9

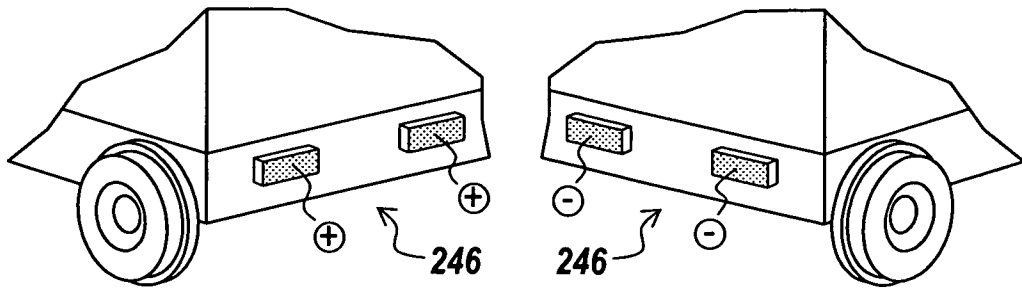


Fig. 10A

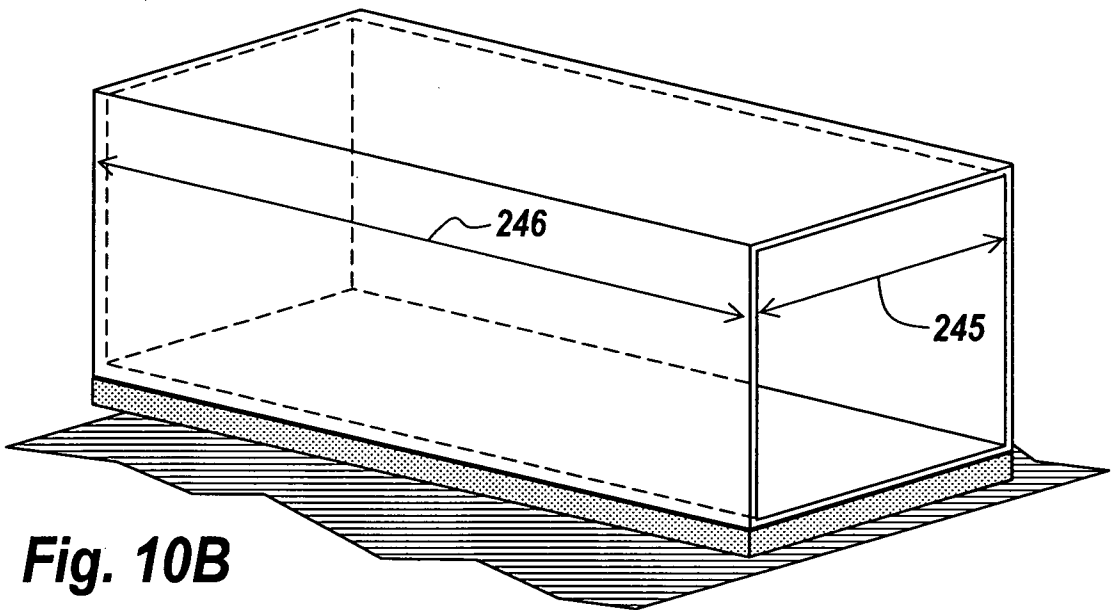


Fig. 10B

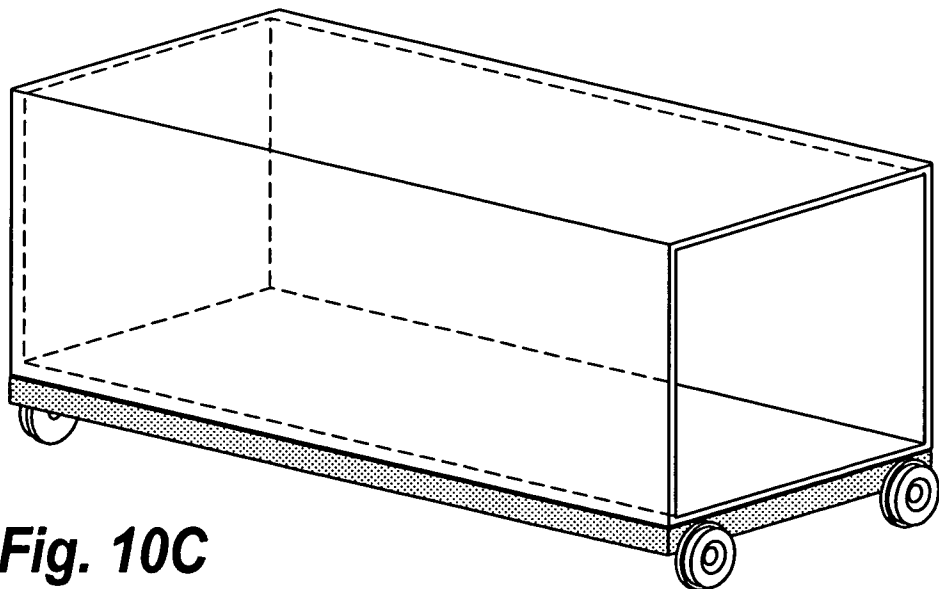


Fig. 10C

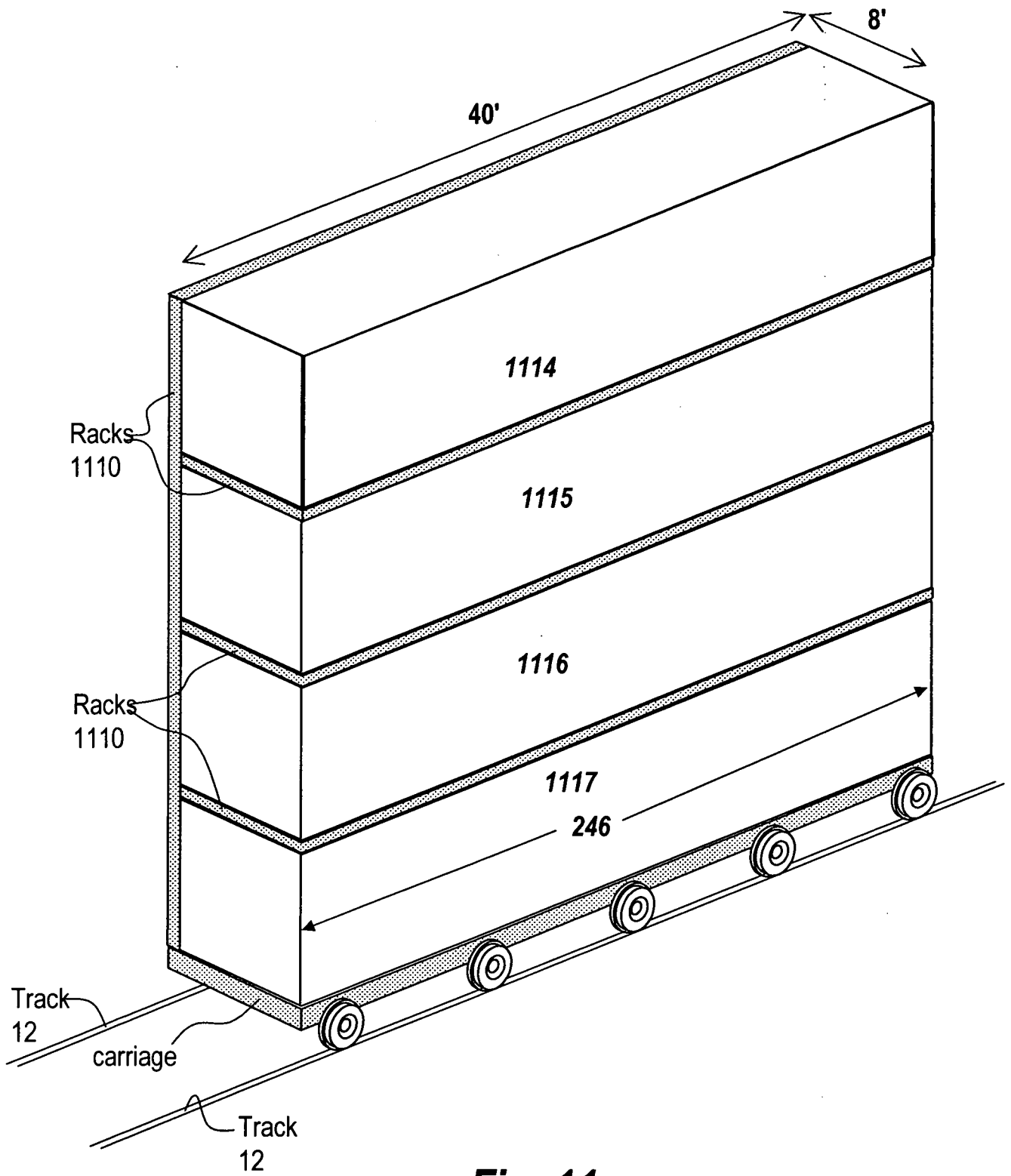


Fig. 11

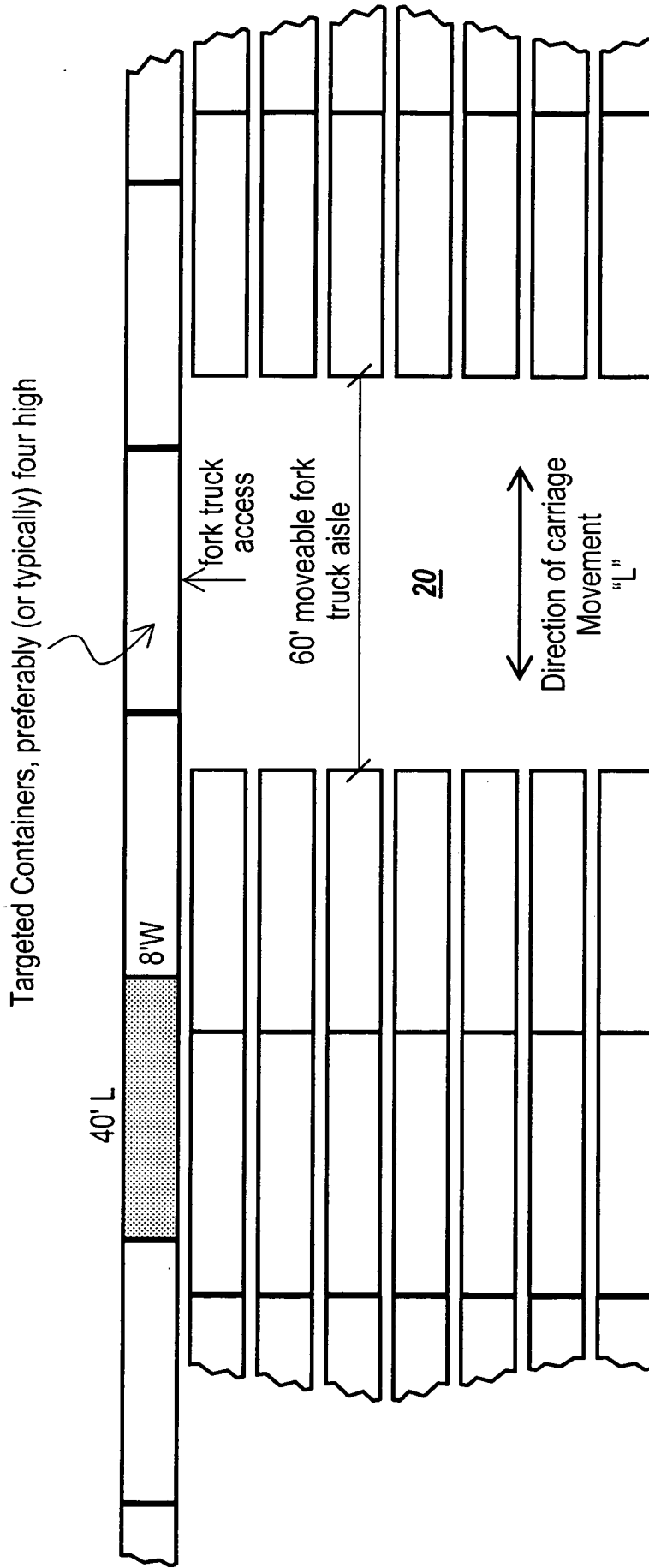


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 09/02950

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G06F 7/00 (2009.01) USPC - 700/214 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) USPC: 700/214 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 700/1, 90, 213, 214, 219; 52/33, 36.1, 79.3; 414/281 -- text search, see search terms below Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST (PGPB,USPT,EPAB,JPAB); Google Search Terms Used: high density, storage, carriage, rack, frame, container, row, array, movable, array, motor, track, magnetic, connect, facility, structure, building, support, insert, access etc.		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,062,242 A (Corcoran) 05 November 1991 (05.11.1991), especially Fig 1-5, 12; col 1, ln 23-24, 49-51, 58-68; col 2, ln 36, 39-41, 44-51; col 3, ln 3, 8-12, 20-36, 37-43, 61-63; col 4, ln 35-36	1-31
Y	US 4,789,210 A (Weiss et al.) 06 December 1988 (06.12.1988), especially Fig 1; col 3, ln 46-51; col 7, ln 5-19, 25-34	1-31
A	US 2004/0165974 A1 (Gironi et al.) 26 August 2004 (26.08.2004)	1-31
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "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 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 26 June 2009 (26.06.2009)		Date of mailing of the international search report 06 JUL 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774