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(71) Applicant: **HEWLETT PACKARD ENTERPRISE DEVELOPMENT LP** [US/US]; 11445 Compaq Center Drive West, Houston, TX 77070 (US).

(72) Inventors: **WENNER, Stefan**; Schickardstrasse 32, Geb. Businesspark, 71034 Boeblingen (DE). **WARNIMONT, Jennifer**; 11311 Chinden Blvd., Boise, Idaho 83714-0021 (US).

(74) Agents: **SURESH, Anup** et al.; Hewlett Packard Enterprise, 3404 E. Harmony Road, Mail Stop 79, Fort Collins, CO 80528 (US).

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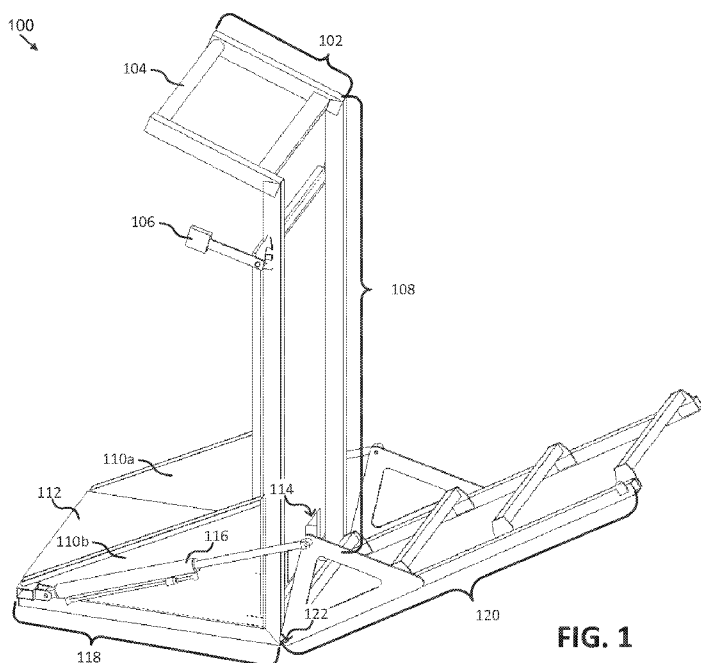


FIG. 1

(57) Abstract: An example apparatus comprises a holding platform, a support platform coupled to the holding platform, a dampening element coupled to the holding platform and the support platform, and a lift-assistance element coupled to the holding platform. The holding platform includes a first portion to hold a load in an upright position when the first portion is substantially parallel to a ground surface, and a second portion to hold the load in a lying position when the first portion is not substantially parallel to a ground surface. The support platform is movable with respect to the holding platform, and the dampening element controls a rate at which the support platform transitions from a first position to a second position with respect to the holding platform. The lift-assistance assists in lifting the holding platform.



**HOLDING PLATFORM TO HOLD A LOAD
AT AN UPRIGHT POSITION AND A LYING POSITION**

BACKGROUND

[1] Warehousing, transportation, and general handling of goods and products often involves use of pallets. Generally, a given pallet may be constructed from metal, plastic, wood, paper, or the like, and constructed to support a load (e.g., of packaged or unpackaged goods, products, or other items) as the load is lifted or moved about by a load lifting machine, such as a forklift truck, loader (e.g., front loader), pallet jack, and the like. Usually, the pallet is has a top surface (e.g., substantially flat top surface) upon which a load of one or more items can be placed. Individual items of a particular load are usually vertically stacked upon the top surface of the pallet. It is not uncommon to use plastic wrapping, straps, or the like to secure the load to the pallet once the load is placed on the pallet. The combination of the pallet and its load is referred to herein as a pallet load. It is common to regard a pallet load as a unit load that can be readily stored or moved about within a warehouse (e.g., store on warehouse racks), or transported using a shipping container, a semi-truck trailer, a train box car, or a cargo hold of an aircraft.

BRIEF DESCRIPTION OF THE DRAWINGS

[2] Certain examples are described in the following detailed description in reference to the following drawings.

[3] FIGs. 1 and 2 illustrate an example apparatus for holding a load.

[4] FIGs. 3-5 illustrate use of an example apparatus for holding a load with respect to a forklift truck and a pallet load.

DETAILED DESCRIPTION OF SPECIFIC EXAMPLES

[5] The height of a given pallet load generally varies with the height of the load being supported by the pallet. The load may comprise vertically-stacked layers of packaged or unpackaged items (e.g., goods or products). With respect to a given pallet load comprising a given load on a given pallet, the given load can be stacked on the given pallet to a height that takes advantage of space available to the given pallet load during its transportation or storage. Taking advantage of the space can reduce the number of pallets that would otherwise be needed to transport or store the given load using pallets. Also, the transportation and storage costs associated with the given load can be reduced based on the improved use of available space. For example, the load of a particular pallet load could be stacked such that the particular pallet load has a height of 2400mm and makes ideal use of cargo space available in aircrafts and ground vehicles involved in the transportation of the particular pallet load.

[6] Unfortunately, stacking the load of a pallet load to take advantage of transportation or storage space can result in the pallet load losing vertical clearance, such as with respect to certain passage ways, doorways, or inspection devices. For instance, while the load of a pallet load may be stacked such that the pallet load has a height of 2400mm to take advantage of transportation space, an x-ray machine involved in its inspection may be technically or legally limited to inspecting cargo that has a maximum height of 1800mm. In this instance, without another x-ray machine capable of inspecting cargo having that height, the pallet load of 2400mm would need to be divided at least into multiple pallet loads capable of passing through the 1800mm x-ray machine, and then possibly transporting the cargo as multiple pallet loads or remerging the multiple pallet loads into a single pallet load. This can result in use of additional pallets, use of additional space (e.g., additional vertical space used by the additional pallets), an increase in transportation weight by the additional pallets, inefficient use of available transportation space, decrease in transportation throughput, additional time (e.g., to remerge multiple pallet loads into a single pallet load), or some combination thereof.

[7] Various examples described herein provide for an apparatus to hold a load, such as a pallet load, and assist in tilting or tipping over the load such that the load moves from a first position (e.g., upright position) to a second position (e.g., a lying position). By moving the load from the first position to the second position, the apparatus can increase the load's vertical clearance, which can be useful in clearing certain vertical obstacles, such as a vertically-limiting cargo inspection machine. For various examples described herein, after the apparatus assists with tilting or tipping over the load from the first position to the second position, the apparatus assists in lifting the load back to the first position from the second position. In this way, some examples can assist in obtaining at least temporary vertical clearance for a load. Additionally, for some examples, the apparatus assists a load lifting machine, such as a forklift truck, in tilting or tipping over a load from a first position (e.g., upright position) to a second position (e.g., lying position), and then assists the load lifting machine in lifting the load from the second position back to the first position (e.g., restoring the load to the upright position).

[8] FIG. 1 illustrates an example apparatus 100 for holding a load, and, in particular, holding a load at an upright position, at a lying position, and in between as the load transitions between the upright position and the lying position. The example apparatus 100 can assist a load lifting machine, such as a forklift truck or the like, in moving a load it is holding from an upright position, to a tilted or lying position, and back. As shown, the apparatus 100 comprises a first portion 118 of a holding platform, a second portion 108 of a holding platform, a support platform 120, a dampening element 116, and a lift-assistance element 102. In FIG. 1, the first portion 118 is coupled to the second portion 108, the support platform 120 is coupled to and movable with respect to the holding platform (formed by the first portion 118 and second portion 108), the dampening element 116 is coupled to the support platform 120 and to the first portion 118 (of the holding platform), and the lift-assistance element 102 coupled to the second portion 108 (of the holding platform). Depending on the example, one or more of the first portion 118, the second portion 108, the support platform 120, and the

lift-assistance element may be constructed of a metal, such as aluminum. Additionally, as shown, the apparatus 100 may include

[9] For some examples, the first portion 118 is adapted to hold (e.g., support) a load, such as a pallet load, in an upright position when the first portion is substantially parallel to a ground surface. In FIG. 1, the first portion 118 holds (e.g., supports) a load in the upright position using a planar top surface 112, where the upright load can be placed onto the planar top surface 112 by a load lifting machine. Similarly, for some examples, the second portion 108 is adapted to hold (e.g., support) a load, such as a pallet load, when the load is in a tilted or lying position with respect to a ground surface. When the load is in a tilted or lying position, the first portion 118 may not be substantially parallel with the ground surface but may continue to provide support in holding the load (e.g., where the load remains tilted with respect to the ground surface). The second portion 108 may include a planar top surface (not visible in FIG. 1), which may hold (e.g., support) the load in a tilted or lying position with respect to a ground surface.

[10] For some examples, the second portion 108 is constructed such that when the holding platform is in a lying position, the second portion 108 is engageable by a load lifting machine (e.g., the fork of a forklift truck or a pallet jacket) such that the load lifting machine can lift or move the apparatus 100 while the holding platform is holding a load in a lying position. For instance, in a side of the second portion 108 that is exposed when the holding platform is in a lying position, the second portion 108 may include one or more openings that are engageable by the fork of a forklift truck.

[11] To assist in placing and removing a load (e.g., pallet load) from the planar top surface 112 of the first portion 118 using a forklift truck or the like, the second portion 108 may include one or more openings 114 that allows for forks of the forklift truck to pass through a top surface of the second portion 108. In some examples, the first portion 118 has smaller dimensions than the second portion 108 to facilitate use with particular load sizes. For instance, to facilitate use with particular pallet loads, the second portion 108 may have a height of 90

inches, while the first portion 118 may be sized to hold (e.g., support) a footprint of a 48 inch by 40 inch pallet.

[12] For some examples, the second portion 108 is coupled to the first portion 118 and adapted to hold the load in a laying position when the first portion 118 is not substantially parallel to the ground surface. For some examples, the holding platform formed by the first portion 118 and the second portion 108 functions as a carriage for securely holding a load as the load is being tilted or tipped over between an upright position and another position (e.g., a lying position).

[13] Though examples described herein may provide an apparatus that assists in moving a load between an upright position, where the load is substantially perpendicular to the ground surface, and a lying position with respect to a ground surface, it will be understood that a lying position may be considered a position that orients the load substantially parallel to the ground surface or less than substantially parallel with respect to the ground surface. For example, for some examples, the apparatus tilts or tips over the load 70 degrees from an upright position with respect to the ground surface to a position that orients the load at 30 degrees with respect to the surface. In this way, the load can be rotated by less than or equal to 90 degrees in order to facilitate vertical clearance with respect to the load and a vertical obstacle (e.g., limit of a freight x-ray machine). For some examples, the degree by which the apparatus 100 tilts or tips over a load may be set by a stopping mechanism (e.g., included between the holding platform and the support platform 120) or by the dampening element 116. The degree may be selectable by an operator of the apparatus 100. By doing so, the apparatus 100 can adjusted case-by-case to adjust the degree by which a load is tilted or tipped over and to provide different levels of vertical clearance as needed.

[14] Additionally, for some examples, the first portion 118 and the second portion 108 are coupled to each other to hold the load as the first portion 118 transitions between being substantially parallel and being substantially perpendicular to the ground surface. In FIG. 1, the first portion 118 is coupled to the second portion 108 such that they are substantially perpendicular with respect

to each other. In this way, the first portion 118 and the second portion 108 can form an L-shaped holding platform for receiving and holding a load, with the first portion 118 serving as a first L-portion and the second portion 108 serving as the second L-portion. To strengthen the coupling between the first portion 118 and the second portion 108, the apparatus 100 includes side panels 110a and 110b. For some examples, the side panels 110a and 110b are constructed in a manner (e.g., material or shape) that minimizes the obstruction presented by the side panels 110a and 110b to an inspection machine (e.g., an x-ray machine) configured to examine a load held by the holding platform.

[15] The support platform 120 may be coupled to the holding platform such that the support platform is movable with respect to the holding platform to move between a first position and a second position with respect to the holding platform of the apparatus 100. To facilitate this, the support platform 120 may be coupled to the holding platform by way of a hinge 122, as shown, or by some other mechanical means that permits the support platform 120 to move in a similar manner. In some examples, the support platform 120 is substantially aligned with the first portion 118 of the holding platform when the support platform 120 is in the first position, and the support platform 120 is not substantially aligned with the first portion 118 when the support platform 120 is in the second position. Additionally, in some examples, the support platform 120 is substantially parallel with the second portion 108 of the holding platform when the support platform 120 is in the second position.

[16] According to some examples, the movement between the first and second position with respect to the holding platform permits the support platform 120 to assist in tilting or tipping over a load being held by the holding platform. In FIG. 1, the holding platform is in an upright position with respect to a ground surface and the first portion 118 of the holding platform is parallel with the ground surface. For some examples, the holding platform is holding its load in an upright position when the holding platform is in an upright position. In FIG. 1, the support platform 120 is positioned with respect to the holding surface such that the support platform 120 is lying on the ground surface. For certain examples, the support platform 120 is substantially aligned with the first portion 118 of the

holding platform when the support platform 120 is lying on the ground surface. Additionally, for certain examples, when the holding platform is holding a load upright to a ground surface, and the support platform 120 is lying on the ground surface, the support platform 120 is considered to be ready to assist in tilting or tipping over the load with respect to the ground surface.

[17] According to some examples, when the support platform 120 is on the ground surface, the holding platform is in an upright position (e.g., the first portion 118 is parallel to the ground surface), and the holding platform is tilted or tipped over toward the support platform 120: the first portion 118 of the holding platform transitions from being substantially parallel to being not substantially parallel with the ground surface; the first portion 118 transitions from being substantially aligned to not being substantially aligned with the support platform 120, and the support platform 120 transitions from being substantially perpendicular to the second portion 108 of the holding platform to being substantially parallel to the second portion 108.

[18] The dampening element 116 may be coupled to the holding platform and the support platform 120 to control a rate at which the support platform 120 transitions from the first position to the second position. As shown the dampening element 116 can include a hydraulic cylinder. In other examples, the dampening element 116 includes a spring or the like. For some examples, the apparatus 100 may include two or more dampening elements (e.g., on each side of the apparatus) to assist in controlling the rate of transition of the support platform 120. In addition, the dampening element 116 may be adjustable (e.g., by an operator of the apparatus 100) such that the rate of transition is selectable. For some examples, when the holding platform is upright with respect to a ground surface, and the support platform 120 is positioned on the ground surface and substantially aligned to first portion 118 of the holding platform (as shown in FIG. 1), controlling the rate at which the support platform 120 transitions from being substantially aligned to not being substantially aligned to first portion 118 effectively controls the rate at which the holding platform tilts or tips over from an upright position to another position.

[19] The lift-assistance element 102 may be coupled to the holding platform to assist in lifting the holding platform and, in particular, lifting the holding platform from a tilted or lying position to an upright position. For some examples, when the holding platform is lifted from a tilted or lying position to an upright position, the first portion 118 transitions from being not substantially parallel to being substantially parallel to the ground surface. Additionally, for some examples, as the holding platform is lifted from the tilted or lying position to the upright position, so does a load being held by the holding platform.

[20] For some examples, the lift-assistance element 102 is adapted to be engageable by a load lifting machine, such as a forklift truck, which can lift the holding platform from a tilted or lying position to an upright position. For instance, the lift-assistance element 102 may be engageable by the fork of a forklift truck such that when the fork is vertically lifted, the holding platform is lifted from a tilted or lying position to an upright position. In FIG. 1, the lift-assistance element 102 comprises a bar 104, which for some examples, is engageable by the fork of a forklift truck.

[21] In FIG. 1, the apparatus 100 includes a locking element 106 to lock the support platform 120 to the holding platform when the locking element is engaged. In some examples, the locking element 106 locks the support platform 120 to the holding platform such that the support platform 120 is substantially parallel to the second portion 108 of the holding platform (i.e., not substantially aligned with the first portion 118). According to some examples, when the support platform 120 is on a ground surface, the holding platform is in an upright position, and the holding platform is tilted or tipped over toward the support platform 120, the first portion 118 of the holding platform transitions from being substantially parallel to being not substantially parallel with the ground surface and the second portion 108 becomes substantially parallel to the support platform 120. When this occurs, the locking element 106 may automatically engage and lock the support platform 120 to the second portion 108 of the holding platform such that the support platform 120 and the second portion 108 remain substantially parallel with respect to each other. For some examples, when the locking element 106 is disengaged, the support platform

120 is free to move with respect to the holding platform (e.g., rotate about the hinge 122). Depending on the example, the locking element 106 may comprise a gravity-actuated or a hand-actuated lock.

[22] FIG. 2 illustrates the example apparatus 100 for holding a load and, in particular, illustrates the apparatus 100 in a different state and from a different perspective view than shown in FIG. 1. In FIG. 2, the holding platform is shown in an upright position to the ground surface, the support platform 120 is substantially parallel to the second portion 108 of the holding platform, and the support platform 120 is not substantially aligned with the first portion 118 of the holding platform. In FIG. 2, the second portion 108 of the holding platform is shown to include a planar top surface 202 for holding (e.g., supporting) a load when the holding platform is in a tilted or lying position.

[23] As shown in FIG. 2, the locking element 106 is in an engaged state that locks the support platform 120 to the second portion 108 of the holding platform such that the support platform 120 is substantially parallel with the second portion 108. When the locking element 106 is disengaged, the support platform 120 may move from being substantially parallel with the second portion 108 of the holding platform to being substantially aligned with the first portion 118 of the holding platform, as shown in FIG. 1. Depending on the example, disengaging the locking element 106 in FIG. 2 may cause the support platform 120 to automatically lower toward the ground surface by way of gravity. The support platform 120 may automatically and fully lower itself toward the ground surface or may require some manual assistance by a human (e.g., the operator of a forklift machine). Once on the ground surface, the support platform 120 may assist with tilting or tipping over a load being held by the holding platform.

[24] FIG. 3 illustrates use of the example apparatus 100 with respect to a forklift truck 312 and a pallet load 310. As shown in FIG. 3, at step 300 the forklift truck 312 places the pallet load 310 onto the apparatus 100 while the pallet load 310 is in an upright position. The holding platform of the apparatus 100 is in an upright position, the pallet load 310 is placed on the top surface of the first portion of the holding platform, and the support platform of the apparatus 100 is unlocked from the holding platform.

[25] At step 302, the forklift truck 312 positions itself with respect to the apparatus 100 such that the tip of its fork is underneath the outer edge of the first portion of the holding platform of the apparatus 100. As shown in step 304, this positioning by the forklift truck 312 permits the forklift truck 312 to lift the outer edge of the first portion of the holding platform as it lifts its fork. In doing so, the forklift truck 312 causes the holding platform of the apparatus 100 to tilt or tip towards the support platform 120.

[26] Once the holding platform of the apparatus 100 has passed a certain point, the forklift truck 312 can cease to apply force once gravity causes the holding platform and the pallet load 310 to continue to tilt or tip over on their own. Accordingly, as shown at 306, gravity causes the holding platform of the apparatus 100 and the pallet load 310 to continue to move toward the support platform of the apparatus 100. As described herein, the dampening element of apparatus 100 can control the rate at which the holding platform and the support platform change position with respect to each other. In this way, the dampening element of the apparatus 100 can control the rate at which the holding platform of the apparatus 100 and the pallet load 310 fall towards the ground surface. Eventually, the holding platform of the apparatus 100 and the pallet load 310 reach a lying position with respect to the ground surface, and the holding platform reaches the support platform of the apparatus 100.

[27] At 308, the holding platform of the apparatus 100 reaches the support platform of the apparatus 100 and the locking element 106 of the apparatus 100 automatically engages. At this point, the forklift truck 312 can position itself to lift the apparatus 100 while the holding platform of the apparatus 100 and the pallet load 310 are in a lying position.

[28] FIG. 4 illustrates use of the example apparatus 100 with respect to the forklift truck 312 and the pallet load 310. In FIG. 4, the holding platform of the apparatus 100 is in lying position and the pallet load 310 is in a lying position. As shown, in this state, the forklift truck 312 can lift the apparatus 100 with the pallet load 310 and at step 400, place the apparatus 100 and the pallet load 310 onto a conveyor belt of a freight inspection machine 404 (e.g., x-ray machine). After inspection has completed, at step 402 the forklift truck 312 can lift the apparatus

100 with the pallet load 310 and remove them from the freight inspection machine 404.

[29] FIG. 5 illustrates use of the example apparatus 100 with respect to the forklift truck 312 and the pallet load 310. In FIG. 5, the holding platform of the apparatus 100 is in lying position and the pallet load 310 start in a lying position. At step 500, the forklift truck 312 engages the lift-assistance element of the apparatus 100 using the fork of the forklift truck 312. While maintaining engagement, the forklift truck 312 lifts its fork at step 502 and in doing so, causes the apparatus 100 and the pallet load 310 to be lifted from their lying position. Step 504 shows both the apparatus 100 and the pallet load 310 in an upright position after the forklift truck 312 has completed its lift process of the apparatus 100.

[30] In the foregoing description, numerous details are set forth to provide an understanding of the subject disclosed herein. However, implementations may be practiced without some or all of these details. Other implementations may include modifications and variations from the details discussed above. It is intended that the appended claims cover such modifications and variations.

CLAIMS

1. An apparatus, comprising:
 - a holding platform including a first portion to hold a load in an upright position when the first portion is substantially parallel to a ground surface, and a second portion coupled to the first portion to hold the load in a lying position when the first portion is not substantially parallel to the ground surface, wherein the first and second portions hold the load as the first portion transitions between being substantially parallel and being substantially perpendicular to the ground surface;
 - a support platform coupled to and movable with respect to the holding platform to move between a first position and a second position with respect to the holding platform, wherein at the first position, the first portion is substantially aligned with the support platform, and at the second position, the first portion is not substantially aligned to the support platform;
 - a dampening element coupled to the holding platform and the support platform to control a rate at which the support platform transitions from the first position to the second position; and
 - a lift-assistance element coupled to the holding platform to assist in lifting the holding platform and causing the first portion to transition from being not substantially parallel to being substantially parallel to the ground surface.
2. The apparatus of claim 1, wherein when the first portion transitions from being substantially parallel to being not substantially parallel to the ground surface by the holding platform being flipped in a first direction.
3. The apparatus of claim 2, wherein the holding platform is flipped in the first direction by a load lifting machine.
4. The apparatus of claim 2, wherein when the first portion transitions from being not substantially parallel to being substantially parallel to the ground surface by the holding platform being flipping in a second direction opposite the first direction.

5. The apparatus of claim 4, wherein the holding platform is flipped in the second direction by a load lifting machine.
6. The apparatus of claim 1, wherein the lift-assistance element assists a load lifting machine in lifting the holding platform.
7. The apparatus of claim 6, wherein the lift-assistance element includes a bar engageable by a load lifting machine.
8. The apparatus of claim 1, wherein the dampening element adjustable to alter the rate at which the support platform moves from the first position to the second position.
9. The apparatus of claim 1, comprising a locking element to lock the support platform to the holding platform at the second position when the locking element is engaged.
10. The apparatus of claim 9, wherein the locking element is configured to permit the support platform to move between the first position and the second position when the locking element is disengaged.
11. The apparatus of claim 9, wherein the locking element is configured to automatically engage when the support platform moves from the first position to the second position and the support platform reaches the second position.
12. The apparatus of claim 1, wherein the holding platform receives the load by the load being placed on the first portion while the first portion is substantially parallel to the ground surface.
13. The apparatus of claim 12, wherein the holding platform receives the load from a load lifting machine.
14. An apparatus, comprising:
 - a holding platform including a first portion to hold a load in an upright position when the first portion is substantially parallel to a ground surface, and a second portion coupled to the first portion to hold the load in a lying position

when the first portion is not substantially parallel to the ground surface, wherein the first and second portions holds the load as the first portion transitions from being substantially parallel to being not substantially parallel to the ground surface by a load lifting machine;

a support platform coupled to and movable with respect to the holding platform to move between a first position and a second position with respect to the holding platform, wherein at the first position, the first portion is substantially aligned with the support platform, and at the second position, the first portion is not substantially aligned to the support platform;

a dampening element coupled to the holding platform and the support platform to control a rate at which the support platform transitions from the first position to the second position; and

a lift-assistance element coupled to the holding platform to assist the load lifting machine in lifting the holding platform and causing the first portion to transition from being not substantially parallel to being substantially parallel to the ground surface.

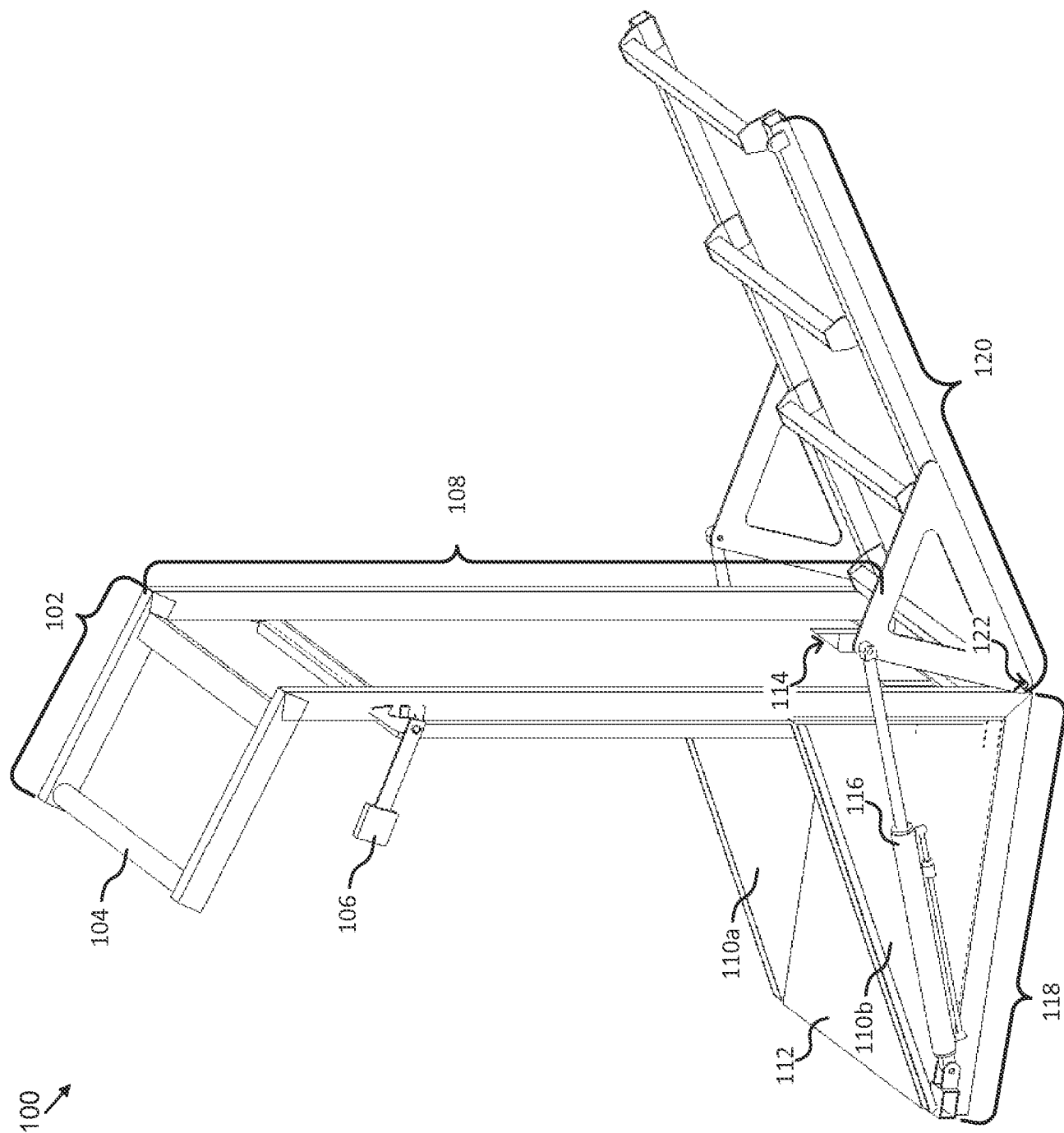
15. An apparatus, comprising:

an L-shaped holding platform comprising a first L-portion and a second portion L-portion substantially perpendicular to the first L-portion, wherein first portion is coupled to a first end of the second L-portion, the first L-portion holds a load in an upright position when the first L-portion is substantially parallel to a ground surface, the second L-portion holds the load in a lying position when the first L-portion is not substantially parallel to the ground surface, and the first and second L-portions hold the load as the first L-portion transitions between being substantially parallel and being not substantially parallel to the ground surface;

a support platform coupled to and movable with respect to the L-shaped holding platform to move between a first position and a second position with respect to the L-shaped holding platform, wherein at the first position, the first L-portion is substantially aligned with the support platform, and at the second position, the first L-portion is not substantially aligned to the support platform;

a dampening element coupled to the L-shaped holding platform and the support platform to control a rate at which the support platform transitions from the first position to the second position; and

a lift-assistance element coupled to a second end of the second L-portion to assist in lifting the L-shaped holding platform and causing the first L-portion to transition from being not substantially parallel to being substantially parallel to the ground surface, wherein the second end is opposite to the first end.



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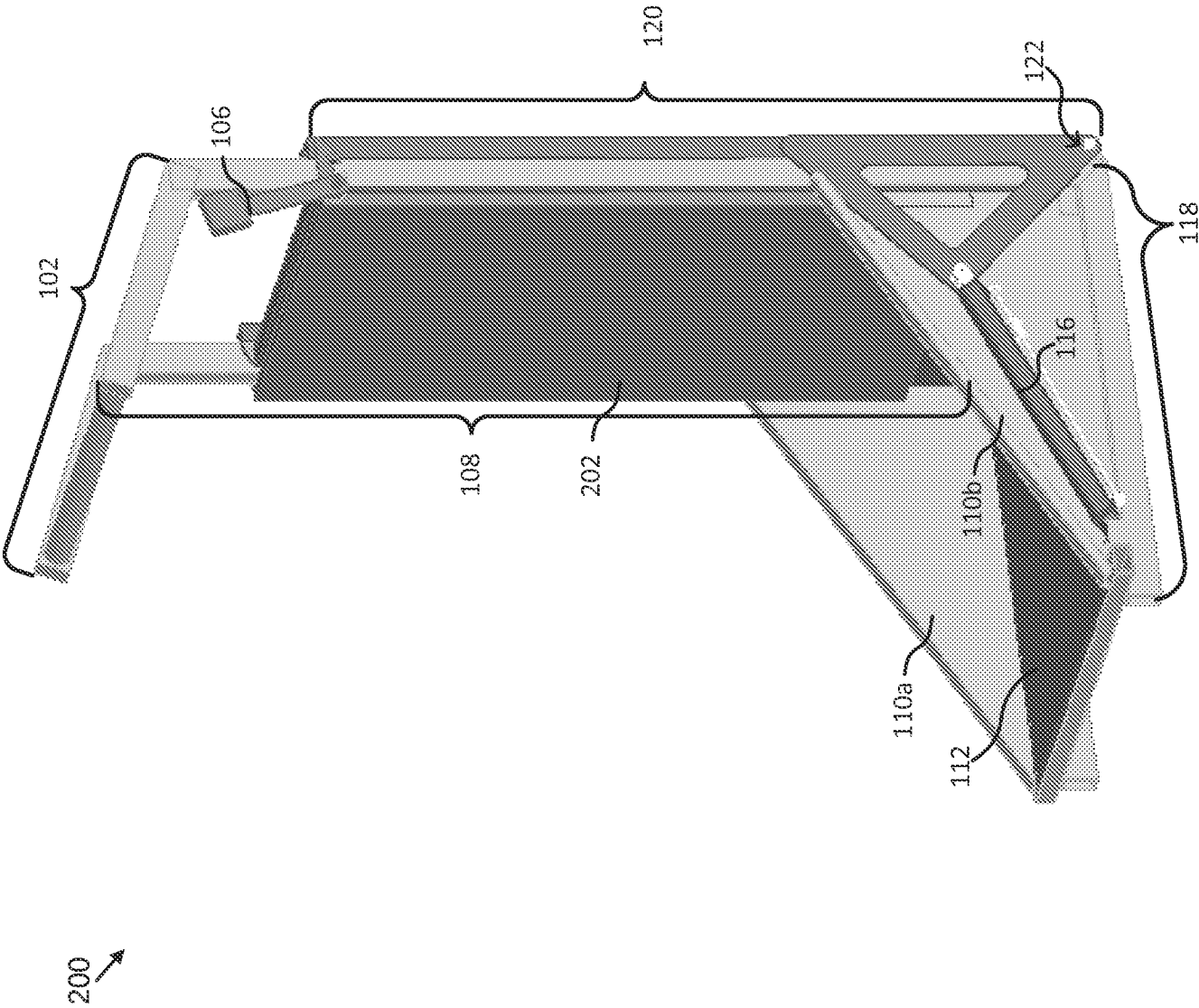


FIG. 2

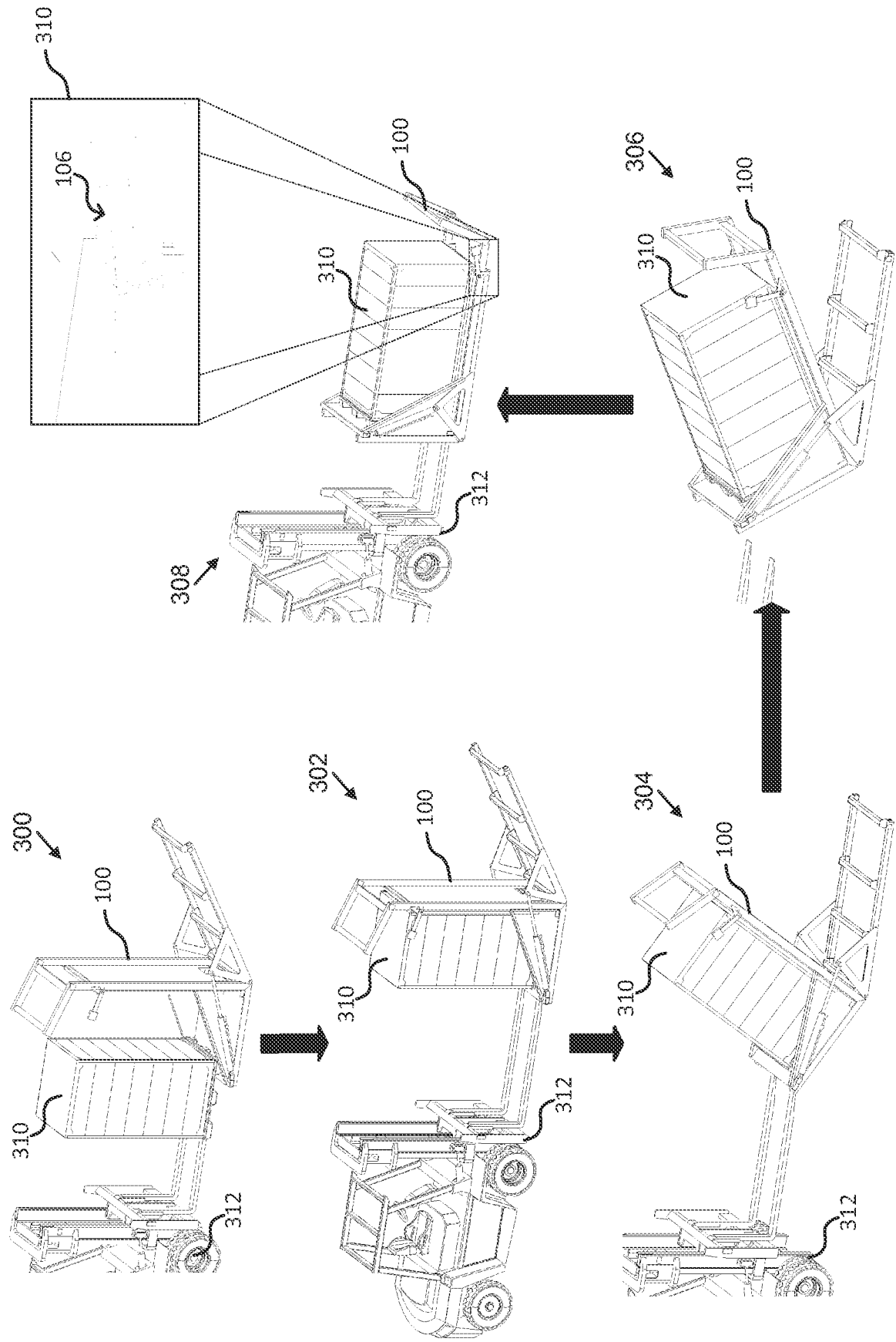
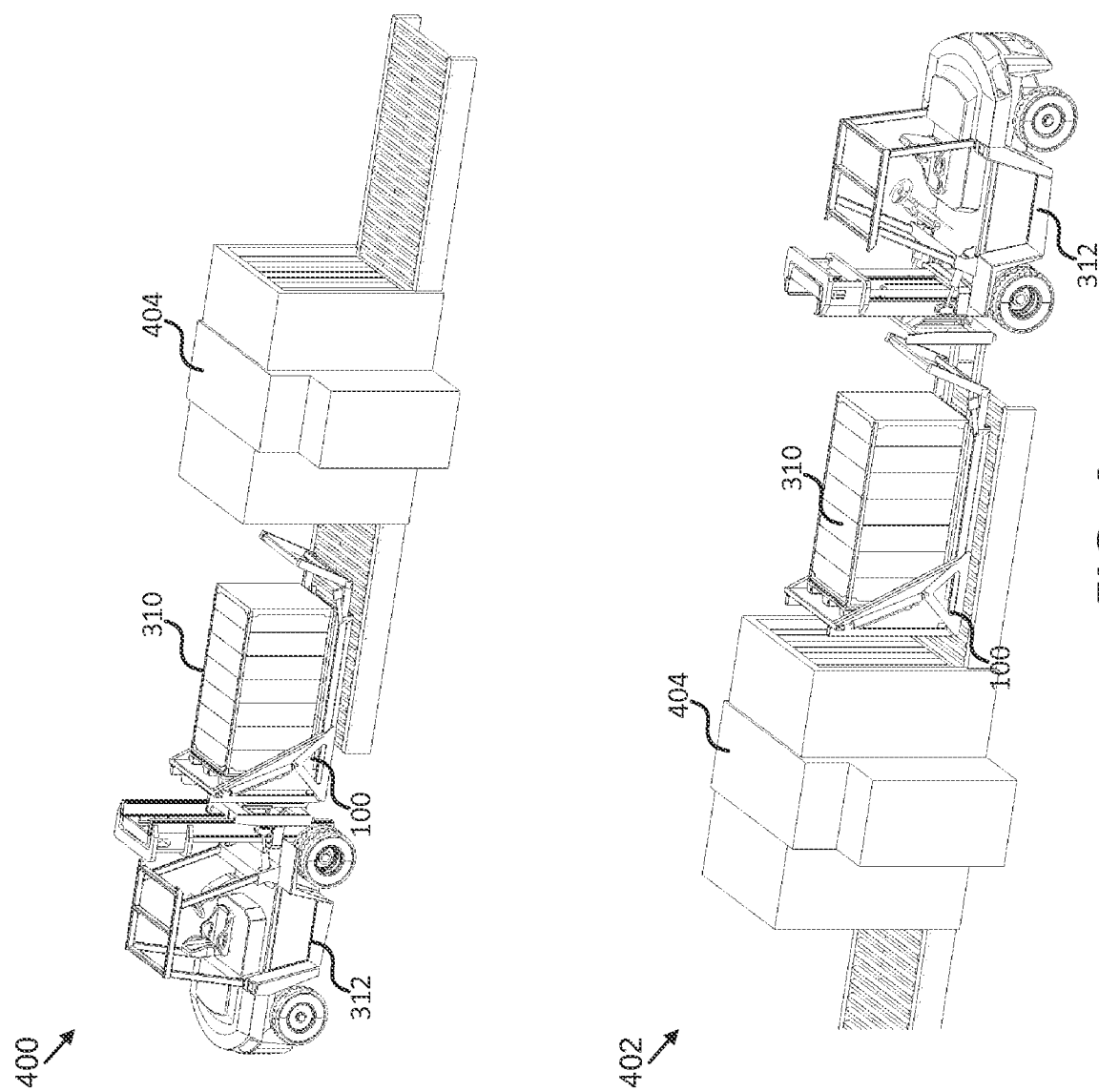


FIG. 3



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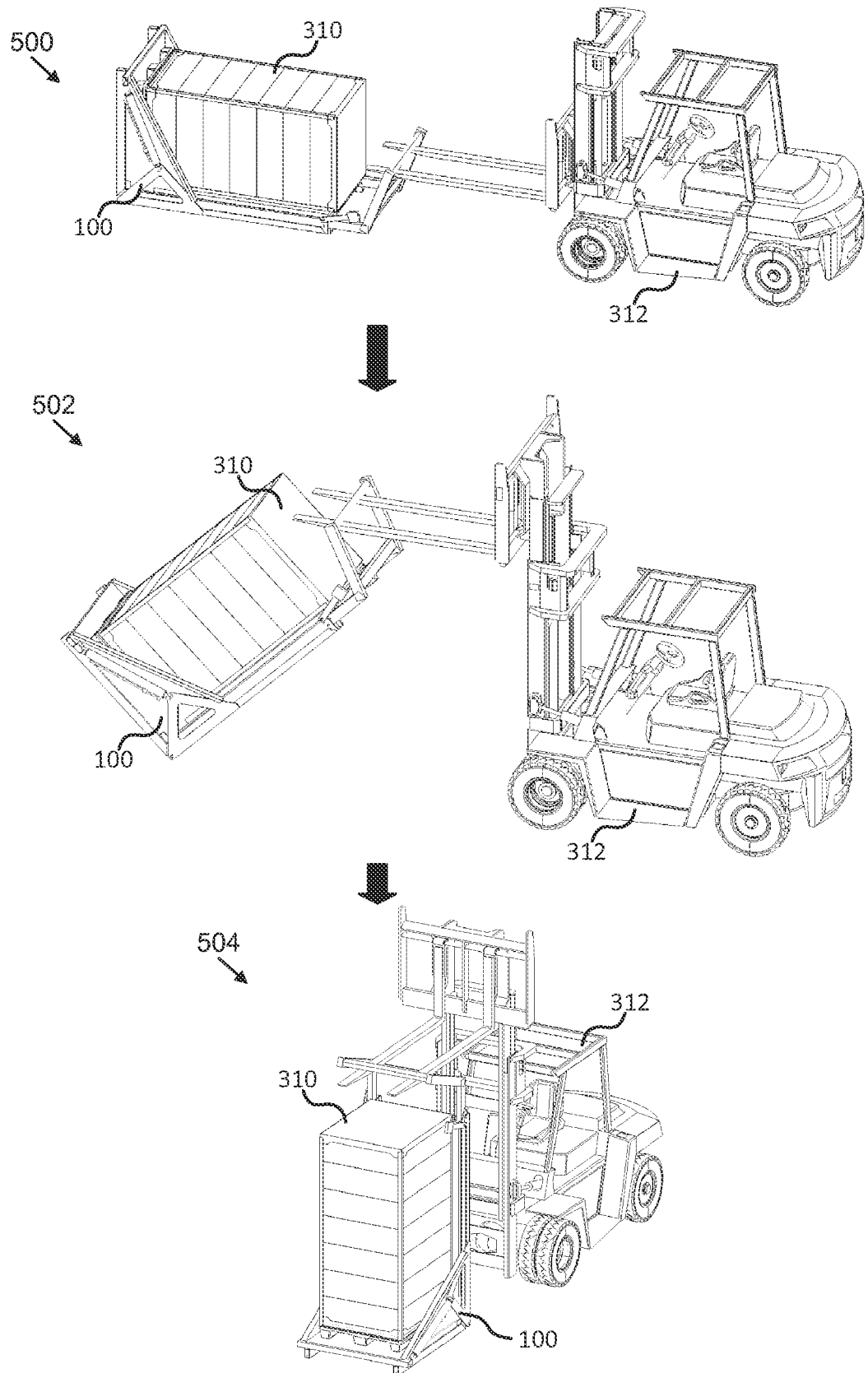


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/017824**A. CLASSIFICATION OF SUBJECT MATTER****B65G 57/28(2006.01)i**

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 57/28; B65G 67/04; B65G 65/34; B65B 21/02; B65G 59/06

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: transport, load, upright, lying, platform, support, dampening, lift, locking, and transition**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009-0317218 A1 (PHELPS et al.) 24 December 2009 See paragraphs [0023]-[0033] and figures 1, 3.	1-15
A	US 4037734 A (ERDMAN, FRANK H.) 26 July 1977 See column 5, line 15 - column 6, line 54 and figures 1A-1C.	1-15
A	US 7018155 B1 (HEBERLING et al.) 28 March 2006 See column 6, lines 38-59 and figure 1.	1-15
A	CN 101172485 A (QINGHUA, LIU) 07 May 2008 See page 5, line 15 - page 6, line 22 and figures 1-4.	1-15
A	US 2003-0175100 A1 (GAY et al.) 18 September 2003 See paragraph [0016] and figure 4.	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

19 November 2015 (19.11.2015)

Date of mailing of the international search report

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Name and mailing address of the ISA/KR

International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 35208,
Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

HWANG, Chan Yoon

Telephone No. +82-42-481-3347



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/017824

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0317218 A1	24/12/2009	US 2007-0065260 A1	22/03/2007
US 4037734 A	26/07/1977	None	
US 7018155 B1	28/03/2006	None	
CN 101172485 A	07/05/2008	None	
US 2003-0175100 A1	18/09/2003	US 6966741 B2	22/11/2005