

(19)



(11)

EP 2 999 523 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
26.04.2017 Bulletin 2017/17

(51) Int Cl.:
A62B 35/00 (2006.01) E04H 12/22 (2006.01)

(21) Application number: **13729142.3**

(86) International application number:
PCT/US2013/042397

(22) Date of filing: **23.05.2013**

(87) International publication number:
WO 2014/189512 (27.11.2014 Gazette 2014/48)

(54) LOW-PROFILE FALL-PROTECTION COUNTER-WEIGHT APPARATUS

GEGENGEWICHT FÜR STURZSICHERUNGSAPPARATE MTI NIEDRIGEM PROFIL

APPAREIL À CONTREPOIDS PEU ENCOMBRANT DE PROTECTION CONTRE LES CHUTES

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(74) Representative: **Houghton, Mark Phillip
Patent Outsourcing Limited
1 King Street
Bakewell, Derbyshire DE45 1DZ (GB)**

(43) Date of publication of application:
30.03.2016 Bulletin 2016/13

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GB-A- 2 446 859 NL-C2- 1 012 984
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(73) Proprietor: **Honeywell International Inc.
Morris Plains, NJ 07950 (US)**

• **ANONYMOUS: "Mobile anchor point",
RESEARCH DISCLOSURE, MASON
PUBLICATIONS, HAMPSHIRE, GB, vol. 488, no.
7, 1 December 2004 (2004-12-01), XP007134532,
ISSN: 0374-4353**

(72) Inventor: **VIKMYR, Anders
Morristown, New Jersey 07962-2245 (US)**

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Description**TECHNICAL FIELD**

[0001] Various embodiments relate generally to fall-protection systems.

BACKGROUND

[0002] Fall-protection systems are utilized in industry where it is necessary for a worker to work at an elevated height sufficient to cause serious injury in the event of a fall.

[0003] Utility Model number DE202008003019U1 describes a portable multi-part fall protection and fall arrest system and the use of multiple safety barriers to build a railing-like security system. The system has a fall-protection counter-weight apparatus from counterbalancing weight from a user.

[0004] Patent document number WO94/17866A1 describes a portable basketball system with a ballast-fillable base configured to house the component parts of the basketball system. The basketball system includes a base, a backboard, a basketball goal, a pole, and means for affixing the backboard and goal to the pole. The base includes molded recesses for retaining the backboard, basketball goal, a plurality of pole sections, which are joined together to form the pole, and the means for affixing the backboard and goal to the pole, such as threaded fasteners.

[0005] A fall-protection counter-weight apparatus (FPCWA). A fall-protection system is deployed to protect a worker wearing a harness which is further tethered to a boom. The worker has freedom of movement within the range of the boom and cable attached to the harness. The safety cable extends from the harness, along the boom, then over a pulley system and down to the base of the mast. The base of the mast is supported by a counter-weight which serves to suspend the worker in case of a fall. If the weight is inadequate, the worker's fall would fail to be arrested and may face injury in a fall. The structure of these systems is generally quite large and bulky such that storage and shipping is limited and costly.

SUMMARY

[0006] The present invention in its various aspects is as set out in the appended claims.

[0007] Apparatus and associated methods may relate to fall-protection systems having counterweight structures that incorporate a fall-protection mode and storage mode of operation. In an illustrative embodiment, a Fall-protection Counterweight Assembly (FPCWA) provides a fall-protection mode in which the FPCWA is fully assembled and deployed for operation. In an exemplary storage mode, the FPCWA may be disassembled by separating the top portion from legs which separate it from the bottom portion. The legs may be stored, for example,

in a storage module in the bottom portion. In some examples, the legs and/or ancillary elements may be securely stored in the storage mode by compression between the top portion and the bottom portion.

5 [0008] A fall-protection counter-weight apparatus for counterbalancing weight from a user includes a top module with a plurality of horizontal members that support a plurality of top leg couplers and a mast coupler. The base module may include a plurality of horizontal members extending between a pair of base leg couplers, and may have a plurality of legs. A stowage module may be coupled to the base module and disposed, for example, within an interior region generally coplanar with the horizontal members of the base module. A fall-protection mode may provide that the top module is spaced apart from the base module by the legs. Each leg may be releasably coupled at opposing ends to one of the top and bottom leg couplers. In a low-profile mode for storage in some examples, the top module may be directly coupled to the base module by each of the base leg couplers. The legs may be disposed within the stowage module.

10 [0009] Various embodiments may achieve one or more advantages. For example, in some embodiments the different accessories, such as the legs and bracing systems, may be stowed in a stowage module integrated into the base portion of the FPCWA. Various embodiments may be toollessly converted between storage mode and fall-protection mode. In the storage mode, the FPCWA packages all the elements of the assembly in a low-profile, compact, stackable form factor. The stackable form factor may dramatically reduce the volume required for shipping a large number of units, such as in a shipping container. Accordingly, the shipping costs and options for manufacturing remote from the work site may be dramatically improved.

15 [0010] The details of various embodiments are set forth in the accompanying drawings and the description below. Other features and advantages will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS**[0011]**

20 Figure 1 depicts an exemplary fall-protection system incorporating a fall-protection counter-weight apparatus (FPCWA).

Figure 2 depicts multiple FPCWA in a stackable form factor for storage or transport.

25 Figure 3 depicts an exemplary FPCWA in storage mode having all elements of the assembly self-contained.

Figure 4 depicts an exemplary top frame of a FPCWA in storage mode.

30 Figure 5 depicts an exemplary leveling foot coupled to a base module.

Figure 6 depicts an exemplary leveling foot coupled to a base module.

Figure 7 depicts a partially cut-away view of an exemplary mast collar.

Figure 8 depicts a partially cut-away view of an exemplary mast collar having a mast contained therein.

Figures 9A and 9B depict exemplary embodiments of the support structure for the mast collar.

Figures 10A and 10B depict exemplary embodiments of the counter weight forms for the FPCWA.

Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0012] Figure 1 depicts an exemplary fall-protection system incorporating a fall-protection counter-weight apparatus (FPCWA). In the depicted Figure, a fall-protection system 100 is deployed to protect a worker 105 wearing a harness 110 tethered to a boom 115. The boom 115 is supported by a vertical mast 120, which is further coupled to a FPCWA 125 that provides a counterweight for the weight in the event of the fall of the worker 105. The FPCWA 125 includes a top frame 130, legs 135, and a base module 140. In various embodiments, the FPCWA 125 further includes a stowage module 145 in the base module 140 for storage or transport of the legs 135. The legs 135 are releasably coupled to the top frame 130 and the base module 140. The FPCWA 125 may be toollessly converted between a storage mode and a fall-protection mode. In the storage mode, the FPCWA 125 packages all the elements of the assembly in a low-profile, compact, and stackable form factor.

[0013] Figure 2 depicts multiple FPCWA in a stackable form factor for storage or transport. In the depicted Figure, a stack 200 of FPCWA systems 205a-e is illustrated in storage mode. In the storage mode, the FPCWA systems 205a-e package all the elements of the assembly in a low-profile, compact, stackable form factor. The stackable form factor may dramatically reduce the volume required for packaging a large number of systems in a shipping container 210 for storage. In other embodiments, multiple FPCWA systems may be placed on a transport device such as a ship 215 for transporting a large number of systems. Accordingly, the shipping costs and options for manufacturing remote from the work site may be dramatically improved.

[0014] Figure 3 depicts an exemplary FPCWA in storage mode having all elements of the assembly self-contained. In the depicted Figure, a stowed FPCWA 300 is illustrated. In various embodiments, a FPCWA may be toollessly converted between a fall-protection mode (e.g., FPCWA 125, depicted in Figure 1) and a storage mode (e.g., stowed FPCWA 300). The top frame 130 includes a mast collar coupler 305 and mast stabilizers 310a-d extending from the mast collar coupler 305 to top frame couplers 315a-d. The top frame 130 further includes stacking guides 320a-d adjacent top frame cou-

plers 315-d that provide guidance for stacking and maintaining a straight vertical structure of FPCWA systems such as that depicted by stack 200 in Figure 2. The bottom frame 140 includes four base beams 325a-d (only 325a-c are visible in this view) supported by bottom frame feet 330a-d (only 330a and 330b are visible in this view). The bottom frame 140 further includes a stowage module 145 including a mast collar 335, legs 135, form brackets 340a-h and form studs 345a-h. In various embodiments, the bottom surface of the mast collar coupler 305 rests along the top the surface of the legs 135, in a stowed position, and the bottom surface of the mast stabilizers 310a-d rest along the top surface of the form studs 345a-h and mast collar 335. In various embodiments, the position of the top frame 130 relative to the bottom frame 140 may be fixed, having a toolless locking or latching mechanism (not shown). In various embodiments, the material used to construct the top frame 130, bottom frame 140 and legs 135 may include heavy gauge steel, aluminum alloy or other composite, lightweight materials that can withstand the weight needed for a particular application.

[0015] Figure 4 depicts an exemplary top frame of a FPCWA in storage mode. In the depicted Figure, a top frame 130 is further illustrated to show detail as to the structure of the top frame couplers 315a-b. In various embodiments, the top frame couplers 315a-b extend vertically from the mast stabilizers 310a-b to the bottom frame feet 330a-b, when positioned in the storage mode. In various embodiments, the base of one or more of the top frame couplers 315a-d have tapered feature 415a-b to allow ease of alignment during assembly of the FPCWA. The top frame couplers 315a-b further include insertion stops 405a-b to set the depth of the top frame couplers 315a-b of the top frame 130 within the bottom frame feet 330a-b of the bottom frame 140. Further depicted in this illustration is a keyway 420a-b which may be used to mate with a leveling foot and for use as a weep hole to drain water that may accumulate when exposed to outdoor weather conditions.

[0016] Figure 5 depicts an exemplary leveling foot coupled to a base module. In the depicted Figure, a leveling foot 500 of an FPCWA system is illustrated in fall-protection mode. In various applications, the ground surface where the FPCWA is placed may include uneven terrain which can render the FPCWA system unstable and susceptible to tipping over during operation. This can lead to unsafe conditions which can lead to damage to equipment or injury to persons. In various embodiments, leveling feet may be added to the FPCWA system in a toolless manner during assembly into the fall-protection mode. As shown in this illustration, a leveling foot 500 includes a height collar 505 having a foot coupler 510, for mating with bottom frame feet 330, and alignment guide 515 to maintain alignment of the leveling foot 500 in parallel with the bottom frame feet 330. The foot coupler 510 further includes a fastening aperture 520 to mate with a similar aperture in the bottom frame feet 330 (not shown) to receive a toolless coupler 525. The toolless

coupler 525 may include a bolt 530 having a slot for a cotter pin 535. The leveling foot 500 further includes a height guide 540 having threads that mate with a height adjustment wing 545 and an adjustment stop 550 to prevent over adjustment beyond a safe height to maintain structural integrity of the leveling foot 500 above foot plate 555. In various embodiments, the height of the FPCWA system may be adjusted in a toolless manner by adjusting the height adjustment wing 545 to reach the desired resting position. In various embodiments one leveling foot 500 may be affixed to the FPCWA system by way of a keyway mechanism 560. It is also contemplated the multiple leveling feet may be deployed.

[0017] Figure 6 depicts an exemplary leveling foot coupled to a base module. In the depicted Figure, a leveling foot 500, similar to that illustrated in Figure 5, is shown at a different angle to illustrate that the leveling foot 500 may be positioned differently. More than one surface of the foot coupler 510 may include additional fastening aperture 605 to make use of a different orientation in the event that the location where the system is used may impede access to install or adjust system height.

[0018] Figure 7 depicts a partially cut-away view of an exemplary mast collar. In the depicted Figure, a mast collar 335 includes a top cap 705 having an insertion aperture 710 to receive the vertical mast 120 (not shown). The interior of the mast collar 335 includes a mast guide 715 having an upper surface 720 tapered to a lower surface 725 to align the mast 120 within the mast collar 335. In various embodiments, the lower surface 725 includes four surface contact points with the vertical mast 120. The orientations of the four surface contact points are further illustrated in Figure 8.

[0019] Figure 8 depicts a partially cut-away view of an exemplary mast collar having a mast 120 contained therein. In the depicted Figure, the four contact points 805a-d are oriented with respect to the mast 120 to enable minimal contact with the mast 120. In various embodiments, the mast 120 may be sized such that the a circular perimeter surface of that mast will make contact with only one or two of the contact points at a given time and enable the mast 120 to rotate around it's vertical axis with substantially minimal friction. A mast guide fastener 810 is also shown which may stop the mast 120 upon insertion of the mast 120 within the mast collar 335. Further illustrated is a mast collar fastener 815 to secure the mast collar 335 within the mast collar coupler 305 as part of assembly into the fall-protection mode. Similar to the toolless coupler 525, depicted in Figure 5, mast guide fastener 810 and the mast collar fastener 815 may have a toolless coupling feature for ease of assembly or disassembly.

[0020] Figures 9A and 9B depict exemplary embodiments of the support structure for the mast collar. Figure 9A depicts mast collar 935 having base plate 905 and support flanges 910a-c extending from the base plate 905 to an exterior surface of the mast collar 935 to further support the mast 120 in a substantially vertical position

while the FPCWA is in fall-protection mode. The structure of the mast collar 935 shown in Figure 9A allows for the mast collar 935 to pass through the top frame (not shown) in order that the base plate 905 may be mounted directly to either the upper or lower surface of the bottom frame (not shown) of the FPCWA. This configuration adds further support to the vertical mast 120 (not shown) in the event that the mast height is quite long or considerable weight is needed as part of the counterweight. In various embodiments, weight (e.g., sand, rock, cement) used as part of the counterweight ballast may be placed directly on the upper surface of the base plate 905 after the base plate 905 is mounted to the bottom frame.

[0021] 9B depicts mast collar 935 having adjustable braces 915a-d having a sliding fold structure resembling that of an umbrella. In various embodiments, adjustable braces 915a-d further include a runner 920 slidably in contact with mast collar 935, a rib 925a-d extending from the runner 920 to a base stretchers 930a-d, and attached via hinge coupler 940a-d. In various embodiments, the adjustable braces 915 may be further adjustable in length in order to accommodate different size loads or to further support mast collars of varying size. The exterior of the base stretchers may further include fastening apertures for mounting the base stretchers 930a-d to the upper or lower surface of the bottom frame.

[0022] Figures 10A and 10B depict exemplary embodiments of the counter weight forms for the FPCWA. Figure 10A depicts a fall-protection system 100 in fall-protection mode having form braces 1005 (form braces 1005a-d shown) extending between adjacent legs 135a-d and parallel to base beams 325. In various embodiments, a form structure 1015 may be incorporated to create support for counterweight ballast material 1010 of various materials which can be formed within the form structure such as concrete, gravel, sand, etc. In various embodiments, the form braces 1005a-d may be mounted to the legs 135a-d using fasteners that are readily available at the job site such as spare screws. Alternatively, the form braces 1005a-d may be configured for toolless fastening solutions. Further illustrated are form walls 1020 fitted between legs 135 to create a box-like void within the FPCWA and having stud forms 1025 fitted vertically between adjacent form braces 1005. The stud forms 1025 may be fastened between form walls 1020 and form braces 1005a-d using fasteners such as wood screws, sheet-rock screws or nails which are commonly found in the vicinity of a work site.

[0023] Figure 10B depicts a fall-protection system 100, similar to that depicted in 10A, absent stud forms 1025. In various embodiments, more overall volume may be preferred when constructing the counterweight. In various embodiments, it is anticipated that less form structure may be needed such that materials at the job site, such as rocks or dirt, may be deposited within the box-like void to be used to counterweight the FPCWA, which may not require the same structure as poured concrete and more easily removed after use. It is anticipated that the em-

bodiments of Figures 9A and 9B may be suited for the application illustrated in Figures 10A and 10B.

[0024] Although various embodiments have been described with reference to the Figures, other embodiments are possible. For example, the toolless fasteners for fastening the top module to the base module may be a variety of fasteners such as a bolt with a wingnut (i.e., adjust by hand), an unthreaded bolt having a cotter pin as a fastener, and a self-contained locking spring mechanism to eliminate the need for separable parts. Additionally it is contemplated that sufficient space exists within the stowage module for the leveling feet. In some exemplary embodiments, the adjustable feet may be stored on top of the corner posts and formwork support beams.

[0025] A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made. For example, advantageous results may be achieved if the steps of the disclosed techniques were performed in a different sequence, or if components of the disclosed systems were combined in a different manner, or if the components were supplemented with other components. Accordingly, other implementations are contemplated or may reside within the scope of the following claims.

Claims

1. A fall-protection counter-weight apparatus for counterbalancing weight from a user, the apparatus having:

a top module (130) having a plurality of horizontal members that support a plurality of top leg couplers (320a-320d) and mast coupler (305); a base module (140) having a plurality of horizontal members (345a-h), each of the horizontal members extending between a pair of base leg couplers (330a-330b); and, a plurality of legs (135);

wherein in a fall-protection mode adapted for operation, the top module (130) is spaced apart from the base module (140) by the plurality of legs (135), each of the legs (135) being releasably coupled at opposing ends to one of the top leg couplers (320a) and one of the base leg couplers (330a); and, **characterized by**

a stowage module (145) coupled to the base module (140) and disposed within an interior region generally coplanar with the horizontal members (345a-h) of the base module;

wherein in a low-profile mode adapted for storage, the top module (130) is directly coupled to the base module (140) by each of the base leg couplers (330a-330d) coupling to one of the corresponding top leg couplers (320a-320d), each of the legs (135) disposed within the stowage module.

2. The fall-protection counter-weight apparatus of Claim 1, wherein in the fall-protection mode, the top module (130) includes a mast collar (335) coupled to the mast coupler (305) and in the low-profile mode, having the mast collar (335) disposed within the stowage module (145).
3. The fall-protection counter-weight apparatus of Claim 1, wherein the one or more of the plurality of legs (135) being releasably coupled to the base module (140) having toolless fasteners.
4. The fall-protection counter-weight apparatus of Claim 1, wherein one or more of said plurality of legs (135) includes a tapered bottom surface.
5. The fall-protection counter-weight apparatus of Claim 1, wherein one or more of the base leg couplers (330a-330d) includes a keyhole profile aperture (420a-420d) on a bottom surface sized to promote drainage.
6. The fall-protection counter-weight apparatus of Claim 5, further comprising leveling feet having a key profile on a top surface of a foot coupler (510) for coupling to a keyhole profile on a bottom surface of one or more base leg couplers and the leveling feet being releasably coupled to the base module (140) having toolless fasteners.
7. The fall-protection counter-weight apparatus of Claim 6, wherein one or more of the leveling feet includes a toolless height adjusting mechanism (545).
8. The fall-protection counter-weight apparatus of Claim 6, wherein one or more of the leveling feet includes a stop adjustment (405a-b).
9. The fall-protection counter-weight apparatus of Claim 1, wherein one or more of the top frame couplers (315a-b) includes a stacking guide on an upper surface.
10. The fall-protection counter-weight apparatus of Claim 2, wherein the mast collar (335) includes an insertion aperture (710) on an upper surface and a mast guide (715) coupled to an inner surface, the mast guide (715) having one or more tapered surfaces for contact with a mast (120) inserted therein.
11. The fall-protection counter-weight apparatus of claim 2, wherein the mast collar (335) is releasably coupled to the mast coupler using toolless fasteners.
12. The fall-protection counter-weight apparatus of claim 10, wherein the mast contacts fewer than three tapered surfaces of the mast guide (715) at a time.

13. The fall-protection counter-weight apparatus of Claim 10, wherein the mast guide (715) includes a mast stop feature (810) on a lower surface.
14. The fall-protection counter-weight apparatus of Claim 2, wherein the mast collar (335) further comprises a base plate (905) and support braces (910a-c) extending between the base plate (905) and an exterior surface of the mast collar (335).
15. The fall-protection counter-weight apparatus of Claim 2, wherein the mast collar (335) further comprises adjustable support braces (915a-c) coupled to a runner (920) and the support braces (915a-c) slidably coupled to an exterior vertical surface of the mast collar (335).

Patentansprüche

1. Absturzsicherungs Vorrichtung mit Gegengewicht zum Ausgleichen eines Gewichts eines Benutzers, wobei die Vorrichtung Folgendes aufweist:

ein oberes Modul (130), das eine Vielzahl von waagerechten Elementen aufweist, die eine Vielzahl von oberen Schenkelverbindungsstücken (320a bis 320d) und ein Mastverbindungsstück (305) stützen,

ein unteres Modul (140), das eine Vielzahl von waagerechten Elementen (345a-h) aufweist, wobei sich jedes der waagerechten Elemente zwischen einem Paar unterer Schenkelverbindungsstücke (330a bis 330b) erstreckt, und eine Vielzahl von Schenkeln (135),

wobei in einem für den Betrieb geeigneten Absturzsicherungsmodus das obere Modul (130) durch die Vielzahl von Schenkeln (135) von dem unteren Modul (140) beabstandet ist, wobei jeder der Schenkel (135) an gegenüberliegenden Enden auf lösbare Weise mit einem der oberen Schenkelverbindungsstücke (320a) und einem der unteren Schenkelverbindungsstücke (330a) verbunden ist, und **gekennzeichnet durch** ein Staumodul (145), das mit dem unteren Modul (140) verbunden und in einem Innenbereich angeordnet ist, der im Allgemeinen koplanar mit den waagerechten Elementen (345a-h) des unteren Moduls ist,

wobei in einem für die Lagerung geeigneten Niederprofilmodus das obere Modul (130) direkt mit dem unteren Modul (140) verbunden ist, indem jedes der unteren Schenkelverbindungsstücke (330a bis 330d) mit einem entsprechenden der oberen Schenkelverbindungsstücke (320a bis 320d) verbunden ist, wobei jeder Schenkel (135) in dem Staumodul angeordnet ist.

2. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 1, wobei im Absturzsicherungsmodus das obere Modul (130) eine Mastmanschette (335), die mit dem Mastverbindungsstück (305) verbunden ist, umfasst und im Niederprofilmodus die Mastmanschette (335) in dem Staumodul (145) angeordnet ist.
3. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 1, wobei einer oder mehrere aus der Vielzahl von Schenkeln (135) auf lösbare Weise mit dem unteren Modul (140) verbunden sind, das werkzeuglose Befestigungsmittel aufweist.
4. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 1, wobei einer oder mehrere aus der Vielzahl von Schenkeln (135) eine konisch zulaufende untere Fläche umfassen.
5. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 1, wobei eines oder mehrere der unteren Schenkelverbindungsstücke (330a bis 330d) eine mit einem Schlüssellochprofil versehene Öffnung (420a bis 420d) auf einer unteren Fläche umfassen, die so dimensioniert ist, dass sie einen Ablauf ermöglicht.
6. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 5, ferner AusgleichsfüÙe umfassend, die ein Schlüsselprofil auf einer oberen Fläche eines Fußverbindungsstücks (510) zur Verbindung mit einem Schlüssellochprofil auf einer unteren Fläche eines oder mehrerer unterer Schenkelverbindungsstücke aufweist, wobei die AusgleichsfüÙe auf lösbare Weise mit dem unteren Modul (140) verbunden sind, das werkzeuglose Befestigungsmittel aufweist.
7. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 6, wobei einer oder mehrere der AusgleichsfüÙe einen Mechanismus (545) zur werkzeuglosen Höheneinstellung umfassen.
8. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 6, wobei einer oder mehrere der AusgleichsfüÙe eine Anschlageneinstellung (405a-b) umfassen.
9. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 1, wobei einer oder mehrere der oberen Rahmenverbindungsstücke (315a-b) eine Stapelführung auf einer oberen Fläche aufweisen.
10. Absturzsicherungs Vorrichtung mit Gegengewicht nach Anspruch 2, wobei die Mastmanschette (335) eine Einsetzöffnung (710) auf einer oberen Fläche und eine mit einer Innenfläche verbundene Mastführung (715) umfasst, wobei die Mastführung (715) eine oder mehrere konisch zulaufende Flächen zum

Kontakt mit einem in derselben eingesetzten Mast (120) aufweist.

11. Absturzsicherungsrichtung mit Gegengewicht nach Anspruch 2, wobei die Mastmanschette (335) mit werkzeuglosen Befestigungsmitteln auf lösbare Weise mit dem Mastverbindungsstück verbunden ist. 5
12. Absturzsicherungsrichtung mit Gegengewicht nach Anspruch 10, wobei der Mast weniger als drei konisch zulaufende Flächen der Mastführung (715) auf einmal berührt. 10
13. Absturzsicherungsrichtung mit Gegengewicht nach Anspruch 10, wobei die Mastführung (715) ein Mastanschlagmerkmal (810) an einer unteren Fläche umfasst. 15
14. Absturzsicherungsrichtung mit Gegengewicht nach Anspruch 2, wobei die Mastmanschette (335) ferner eine Bodenplatte (905) und Stützverstärkungen (910a-c) umfasst, die sich zwischen der Bodenplatte (905) und einer Außenfläche der Mastmanschette (335) erstrecken. 20
15. Absturzsicherungsrichtung mit Gegengewicht nach Anspruch 2, wobei die Mastmanschette (335) ferner einstellbare Stützverstärkungen (915a-c) umfasst, die mit einem horizontalen Profil (920) verbunden sind, wobei die Stützverstärkungen (915a-c) auf gleitende Weise mit einer senkrechten Außenfläche der Mastmanschette (335) verbunden sind. 25

Revendications

1. Appareil à contrepoids de protection contre les chutes pour contrebalancer le poids d'un utilisateur, l'appareil comprenant: 30

un module supérieur (130) présentant une pluralité d'éléments horizontaux qui supportent une pluralité de coupleurs de pilier supérieurs (320a-320d) et un coupleur de mât (305); 35

un module de base (140) présentant une pluralité d'éléments horizontaux (345a-h), chacun des éléments horizontaux s'étendant entre une paire de coupleurs de pilier de base (330a-330b); et 40

une pluralité de piliers (135);

dans lequel dans un mode de protection contre les chutes apte à fonctionner, le module supérieur (130) est espacé du module de base (140) par la pluralité de piliers (135), chacun des piliers (135) étant couplé de façon détachable à des extrémités opposées à l'un des coupleurs de pilier supérieurs (320a) et à l'un des coupleurs de 45

pilier de base (330a), et **caractérisé par** un module d'arrimage (145) couplé au module de base (140) et disposé à l'intérieur d'une région intérieure essentiellement coplanaire aux éléments horizontaux (345a-h) du module de base;

dans lequel dans un mode de profil bas apte au stockage, le module supérieur (130) est directement couplé au module de base (140) par chacun des coupleurs de pilier de base (330a-330d) qui se couple à l'un des coupleurs de pilier supérieurs correspondants (320a-320d), chacun des piliers (135) étant disposé à l'intérieur du module d'arrimage.

2. Appareil à contrepoids de protection contre les chutes selon la revendication 1, dans lequel dans le mode de protection contre les chutes, le module supérieur (130) comprend un collier de mât (335) couplé au coupleur de mât (305) et dans le mode de profil bas, présentant le collier de mât (335) disposé à l'intérieur du module d'arrimage (145). 25
3. Appareil à contrepoids de protection contre les chutes selon la revendication 1, dans lequel ledit/lesdits un ou plusieurs de la pluralité de piliers (135) couplé(s) de façon détachable module de base (140) comporte(nt) des éléments de fixation sans outil. 30
4. Appareil à contrepoids de protection contre les chutes selon la revendication 1, dans lequel un ou plusieurs de ladite pluralité de piliers (135) présente(nt) une surface inférieure conique. 35
5. Appareil à contrepoids de protection contre les chutes selon la revendication 1, dans lequel un ou plusieurs des coupleurs de pilier de base (330a-330d) comporte(nt) une ouverture à profil en trou de serrure (420a-420d) sur une surface inférieure dimensionnée de manière à favoriser le drainage. 40
6. Appareil à contrepoids de protection contre les chutes selon la revendication 5, comprenant en outre des pieds de mise à niveau présentant un profil de clé sur une surface supérieure d'un coupleur de pied (510) à coupler à un profil de trou de serrure sur une surface inférieure d'un ou plusieurs coupleur(s) de pilier de base et les pieds de mise à niveau étant couplés de façon détachable au module de base (140) comportant des éléments de fixation sans outil. 45
7. Appareil à contrepoids de protection contre les chutes selon la revendication 6, dans lequel un ou plusieurs des pieds de mise à niveau comporte (nt) un mécanisme de réglage de la hauteur sans outil (545). 50
8. Appareil à contrepoids de protection contre les chutes selon la revendication 6, dans lequel un ou plu-

sieurs des pieds de mise à niveau comporte(nt) un réglage d'arrêt (405a-b).

9. Appareil à contrepoids de protection contre les chutes selon la revendication 1, dans lequel un ou plusieurs des coupleurs de cadre supérieurs (315a-b) comporte(nt) un guide d'empilement sur une surface supérieure. 5
10. Appareil à contrepoids de protection contre les chutes selon la revendication 2, dans lequel le collier de mât (335) comporte une ouverture d'insertion (710) sur une surface supérieure et un guide de mât (715) couplé à une surface intérieure, le guide de mât (715) présentant une ou plusieurs surface(s) conique(s) destinée(s) à entrer en contact avec un mât (120) inséré dans celui-ci. 10
15
11. Appareil à contrepoids de protection contre les chutes selon la revendication 2, dans lequel le collier de mât (335) est couplé de façon détachable au coupleur de mât en utilisant des éléments de fixation sans outil. 20
12. Appareil à contrepoids de protection contre les chutes selon la revendication 10, dans lequel le mât est en contact avec moins de trois surfaces coniques du guide de mât (715) à la fois. 25
13. Appareil à contrepoids de protection contre les chutes selon la revendication 10, dans lequel le guide de mât (715) comporte une caractéristique d'arrêt de mât (810) sur une surface inférieure. 30
14. Appareil à contrepoids de protection contre les chutes selon la revendication 2, dans lequel le collier de mât (335) comprend en outre une plaque de base (905) et des entretoises de support (910a-c) qui s'étendent entre la plaque de base (905) et une surface extérieure du collier de mât (335). 35
40
15. Appareil à contrepoids de protection contre les chutes selon la revendication 2, dans lequel le collier de mât (335) comprend en outre des entretoises de support réglables (915a-c) couplées à un longeron (920) et les entretoises de support (915a-c) sont couplées de façon coulissante à une surface verticale extérieure du collier de mât (335). 45

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55

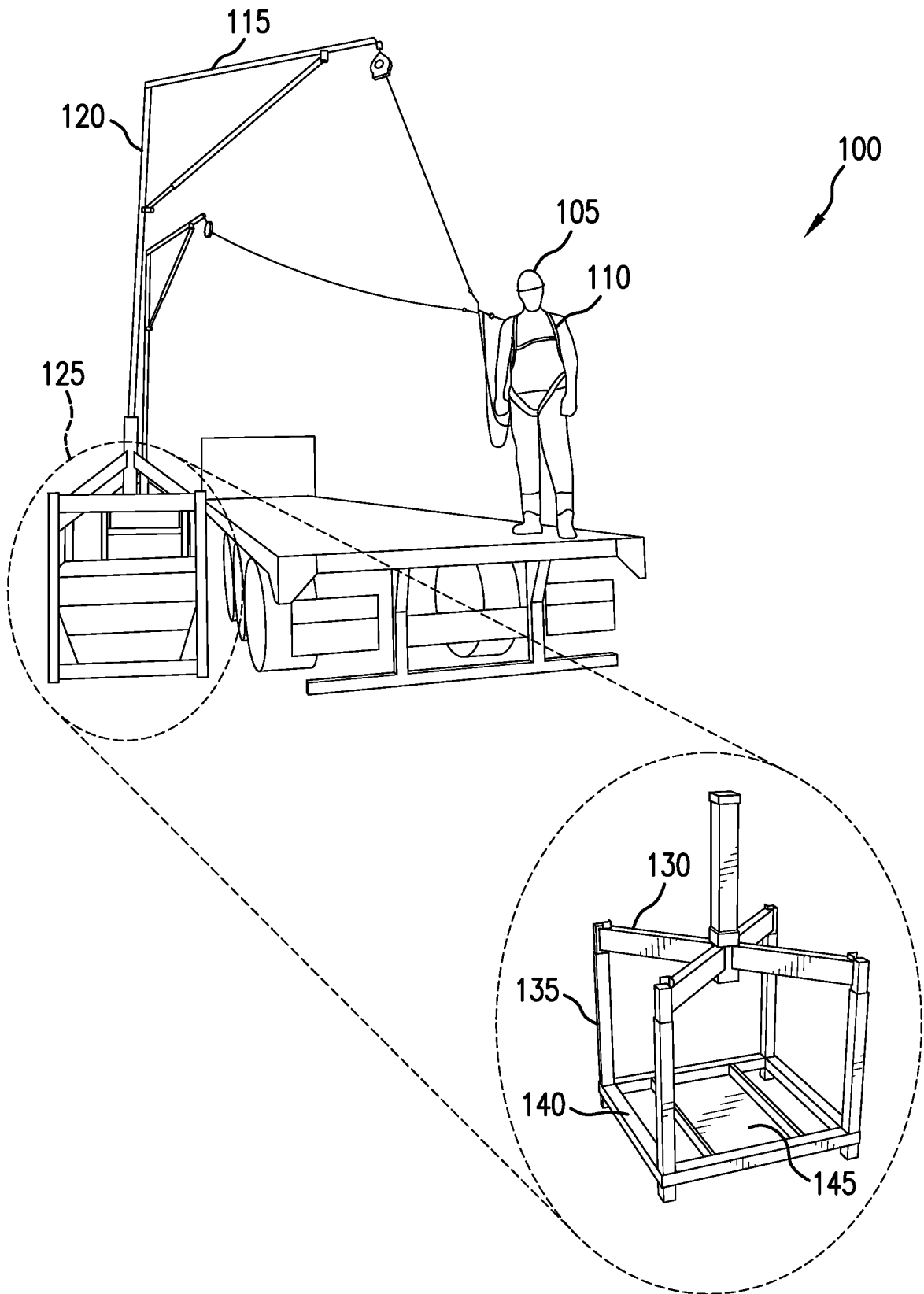


FIG. 1

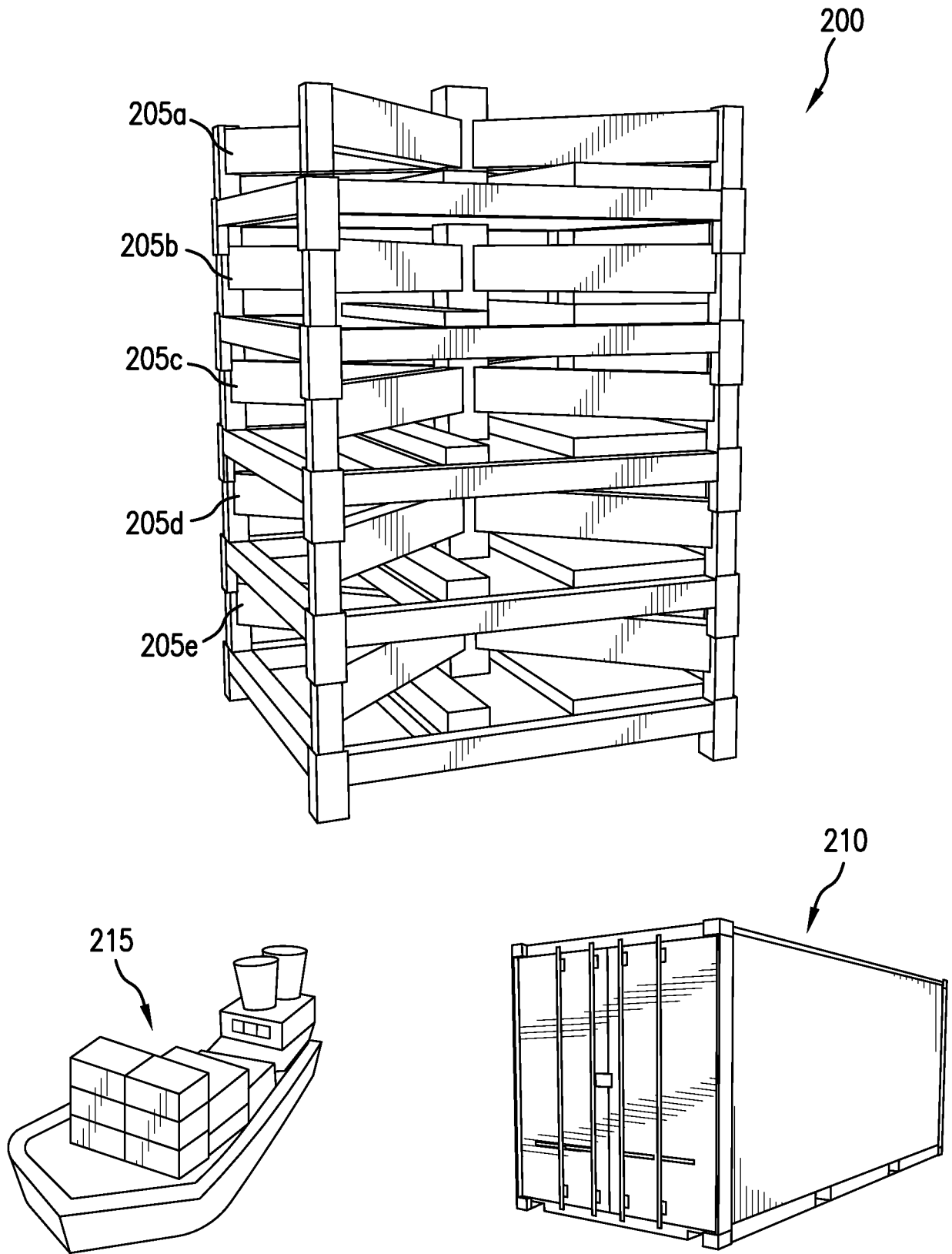


FIG. 2

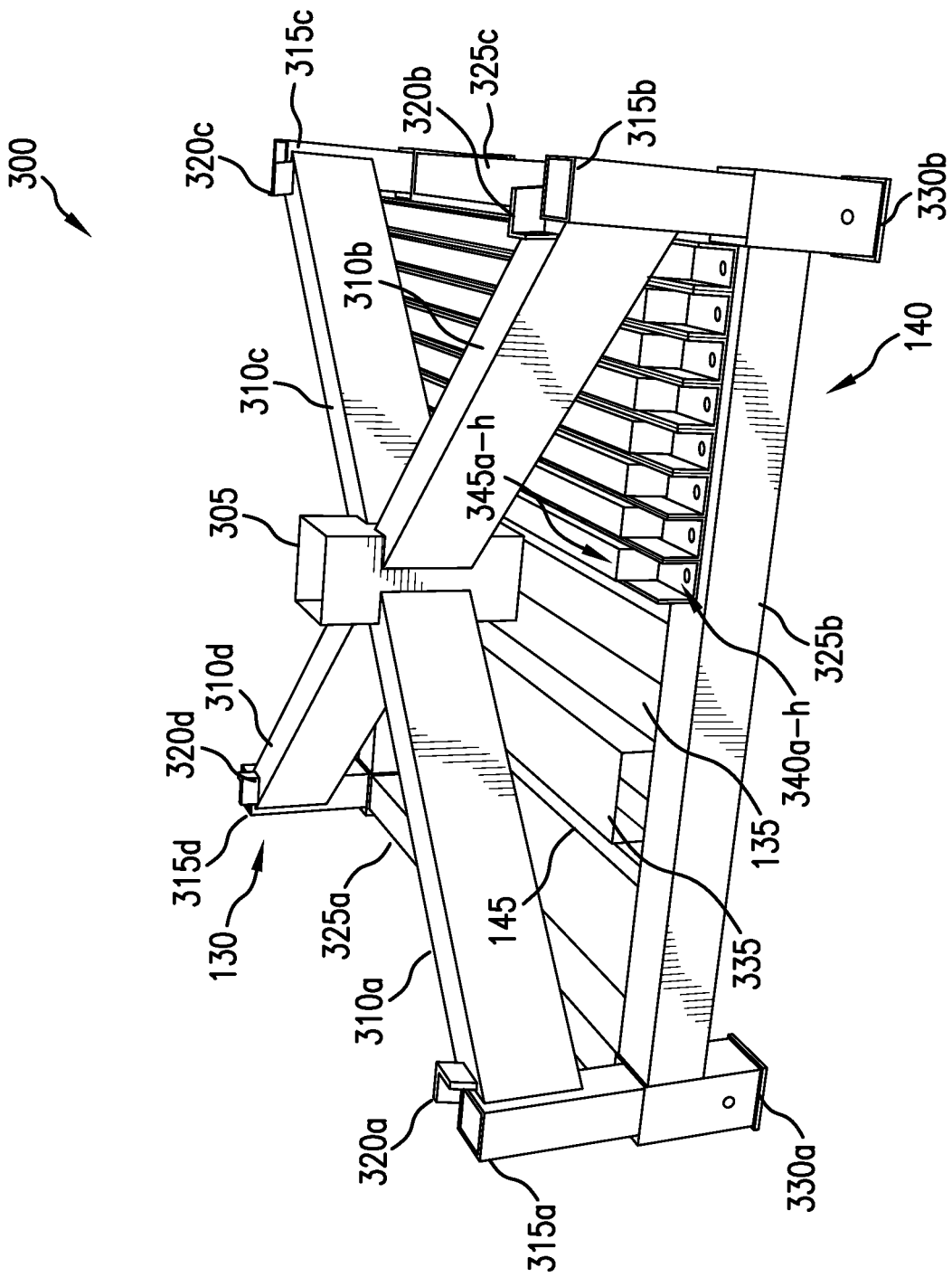


FIG. 3

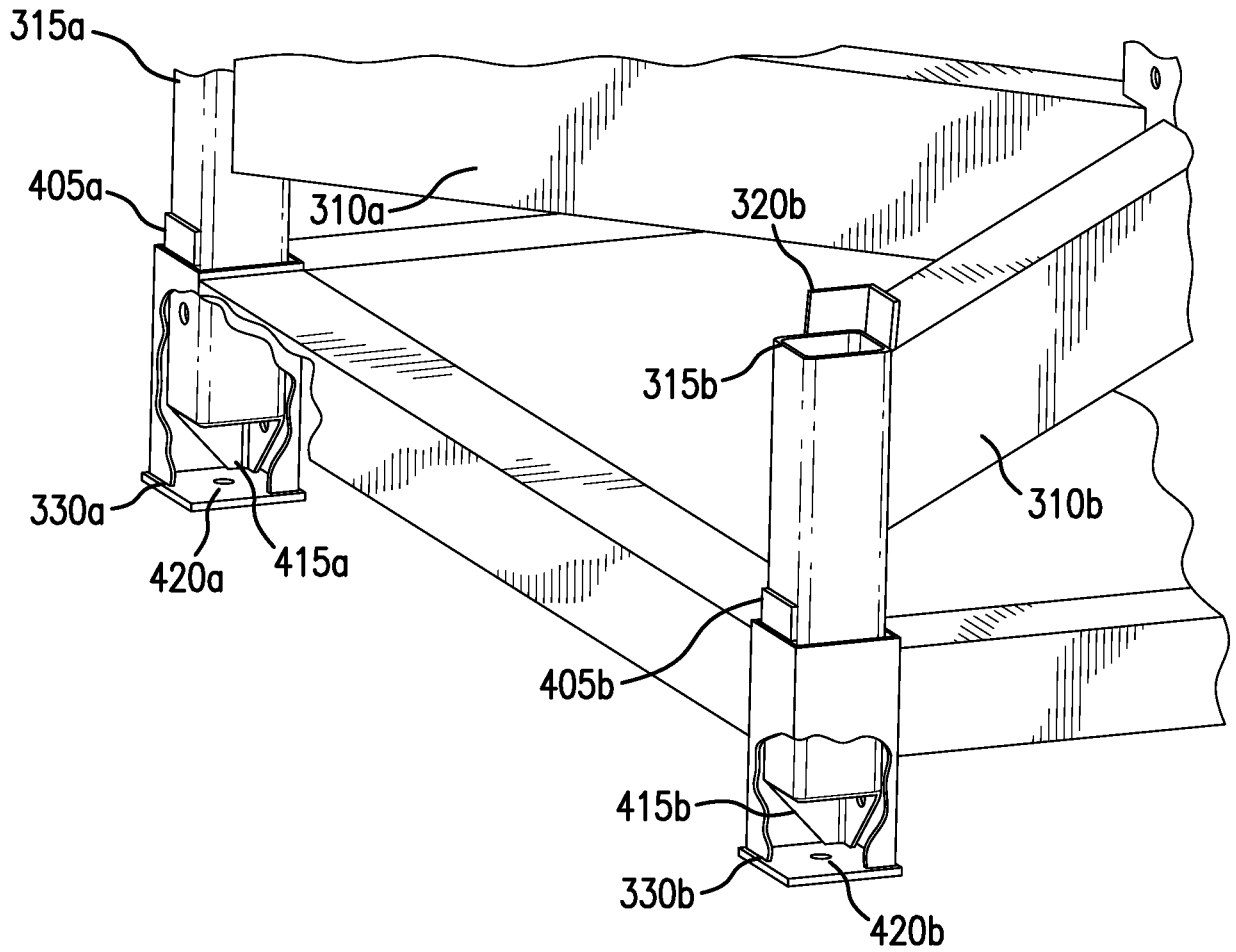


FIG. 4

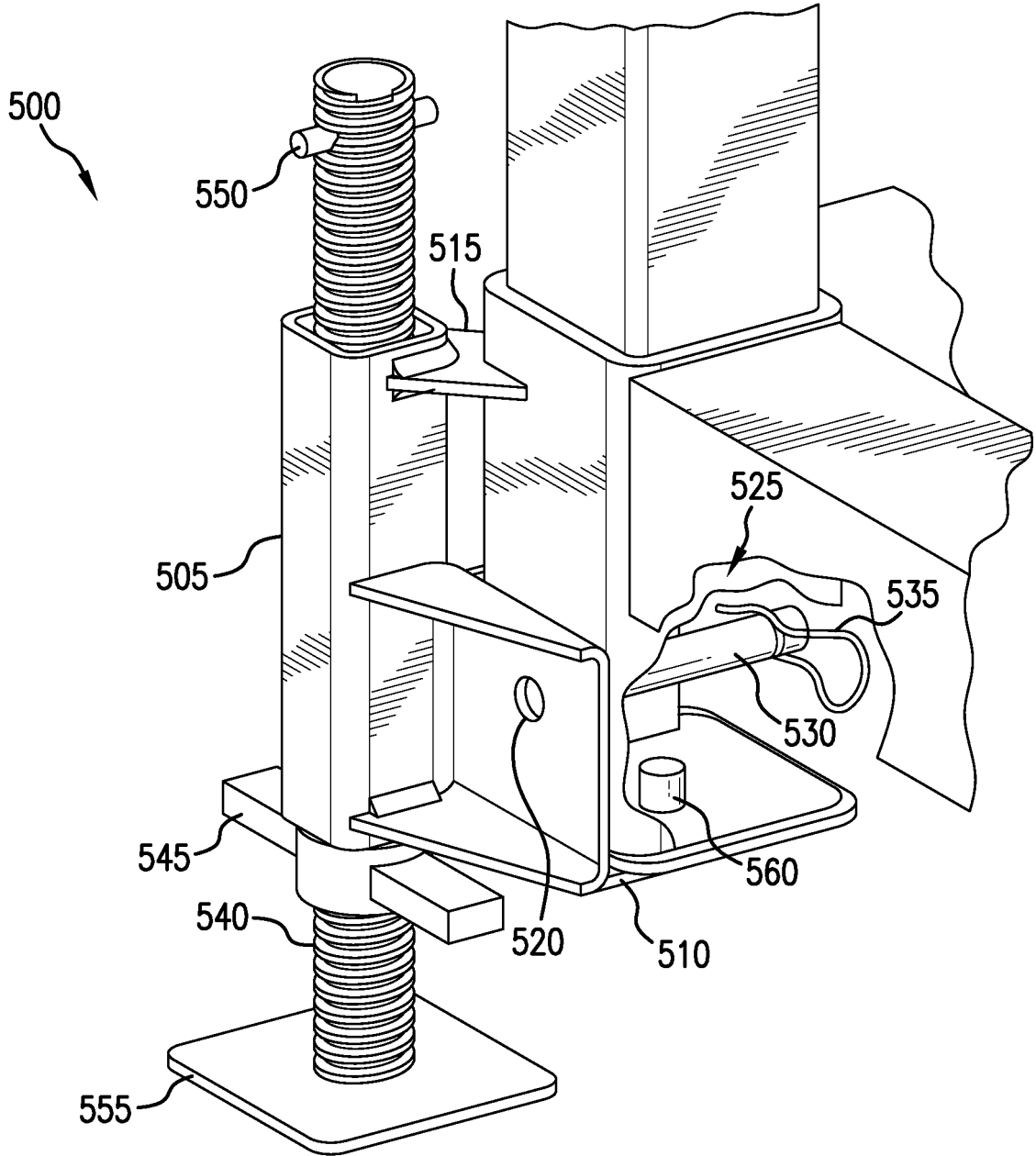


FIG.5

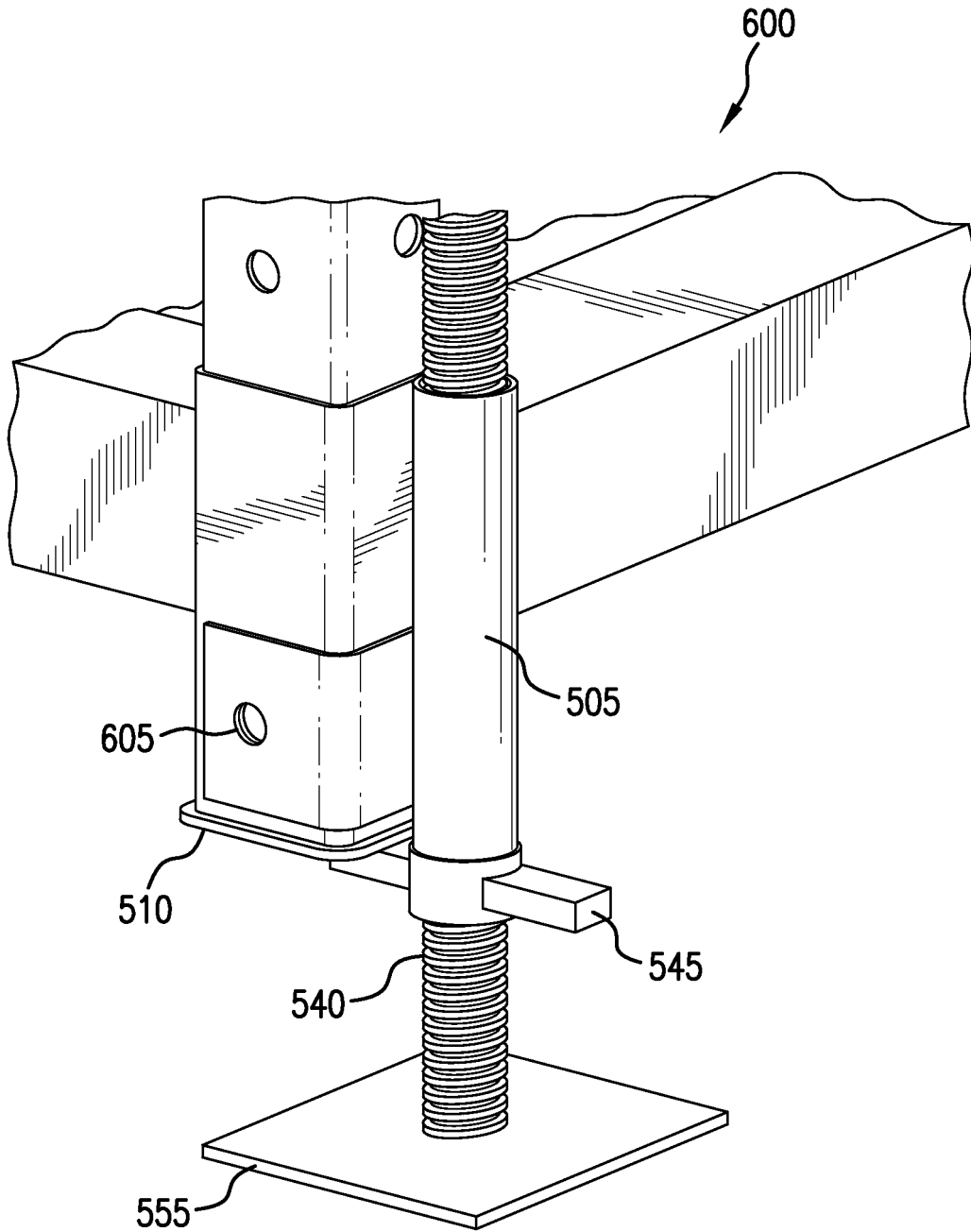


FIG. 6

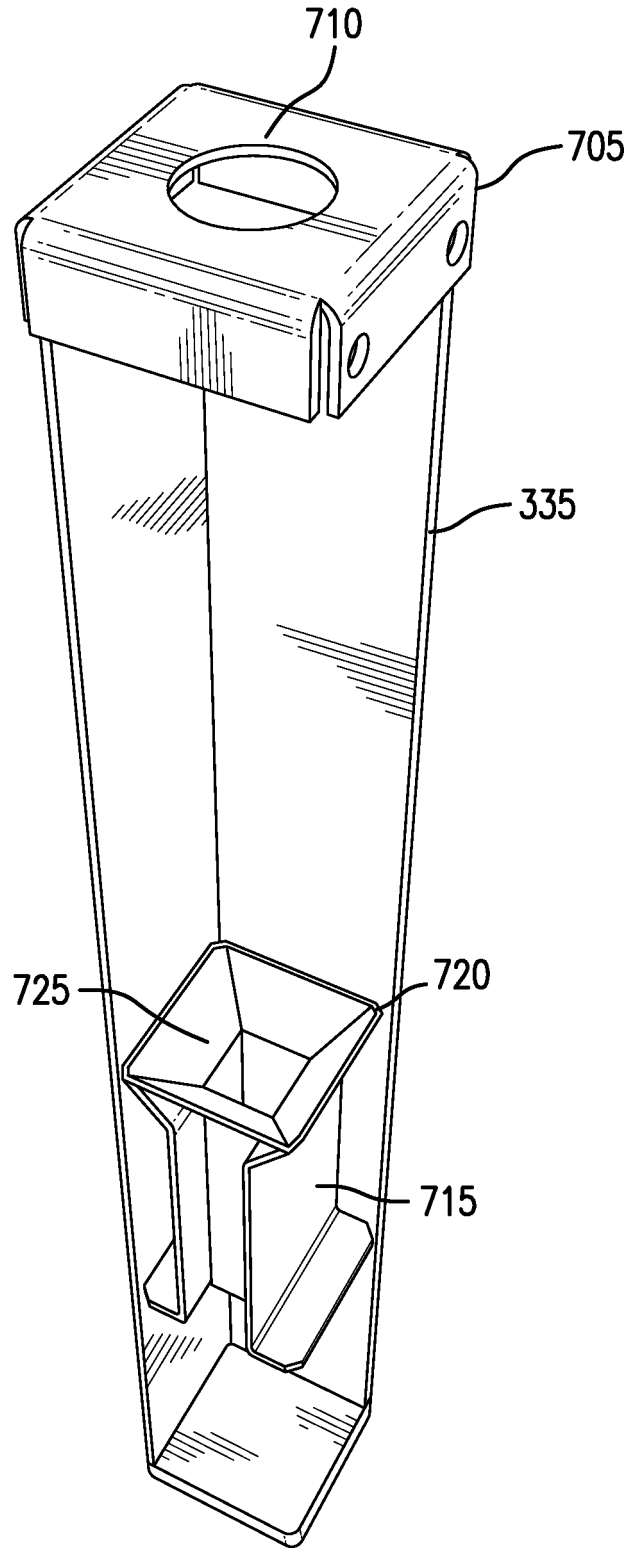


FIG. 7

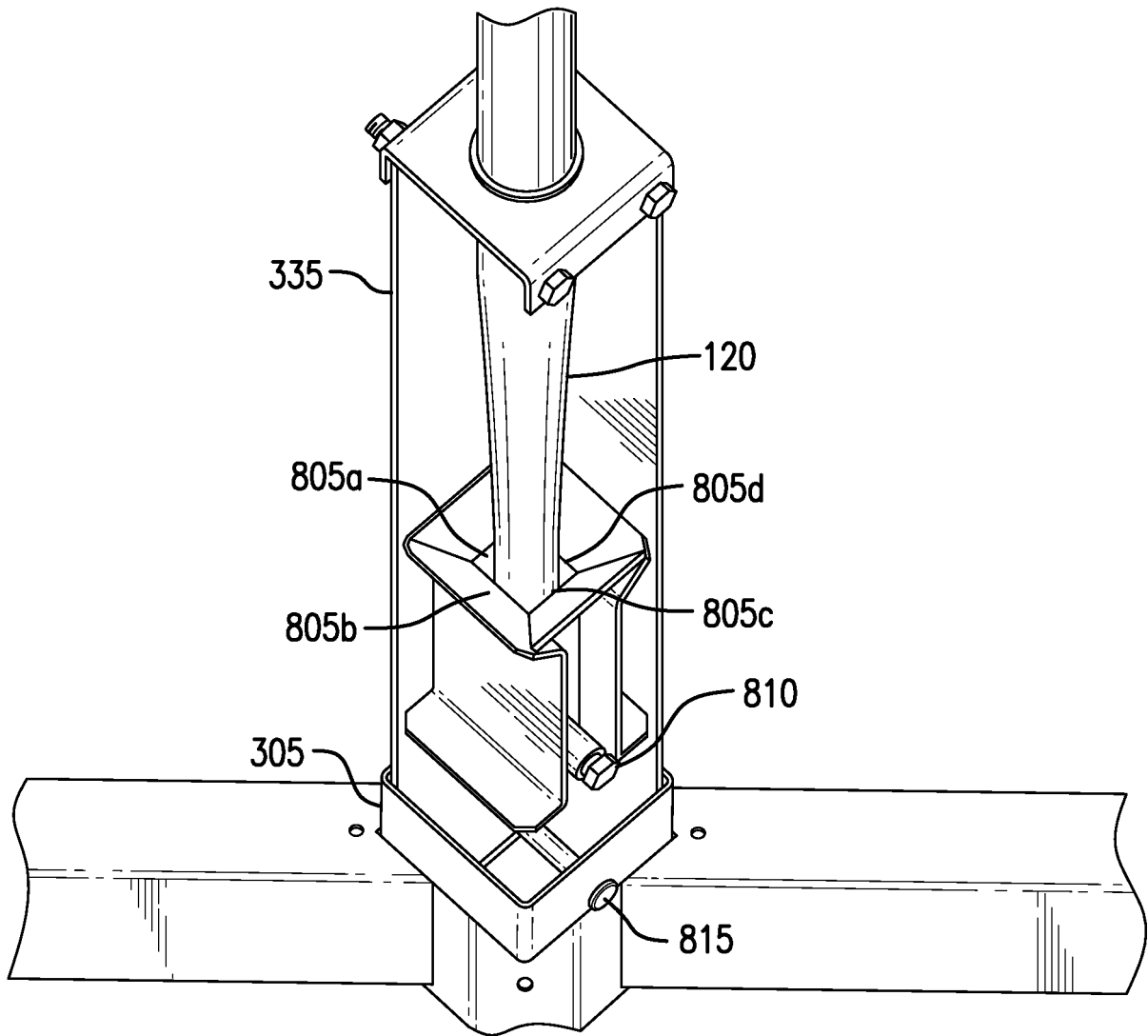


FIG. 8

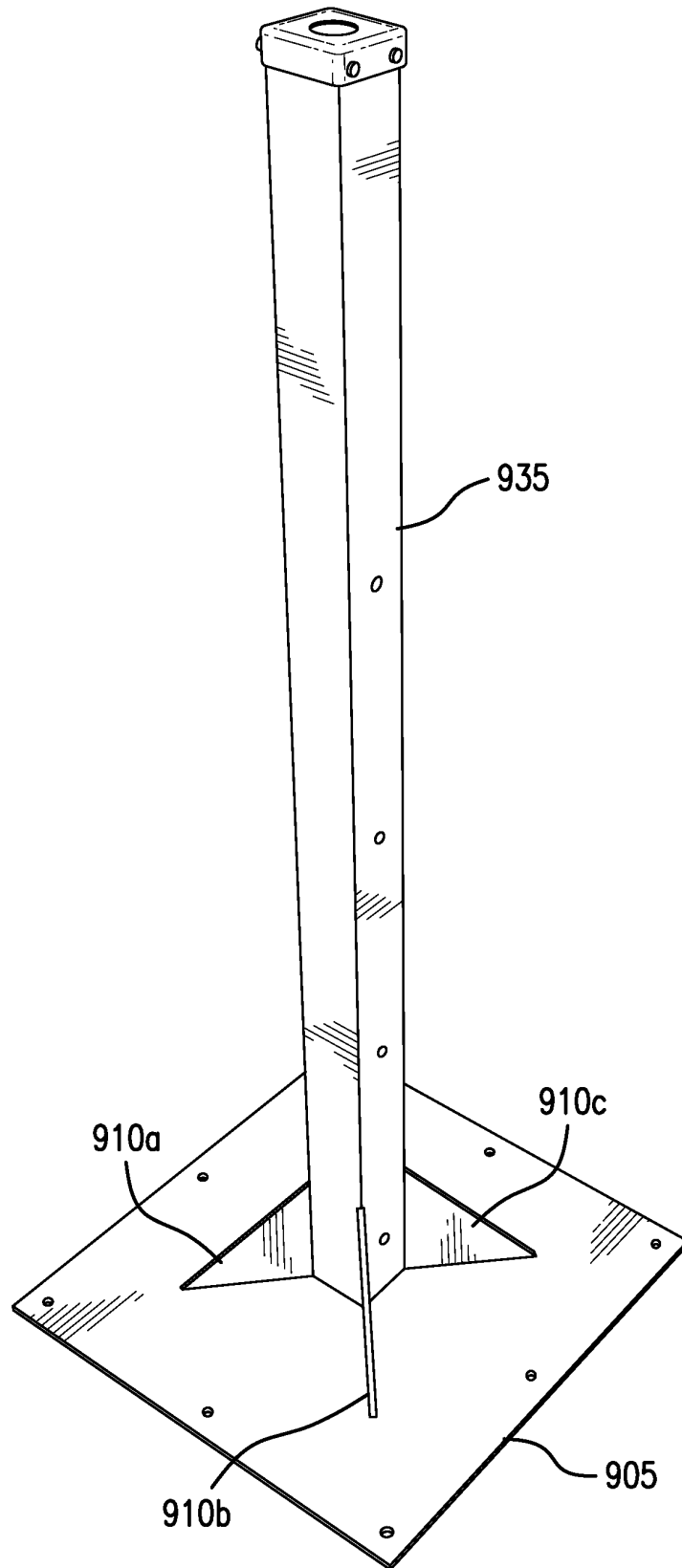


FIG.9A

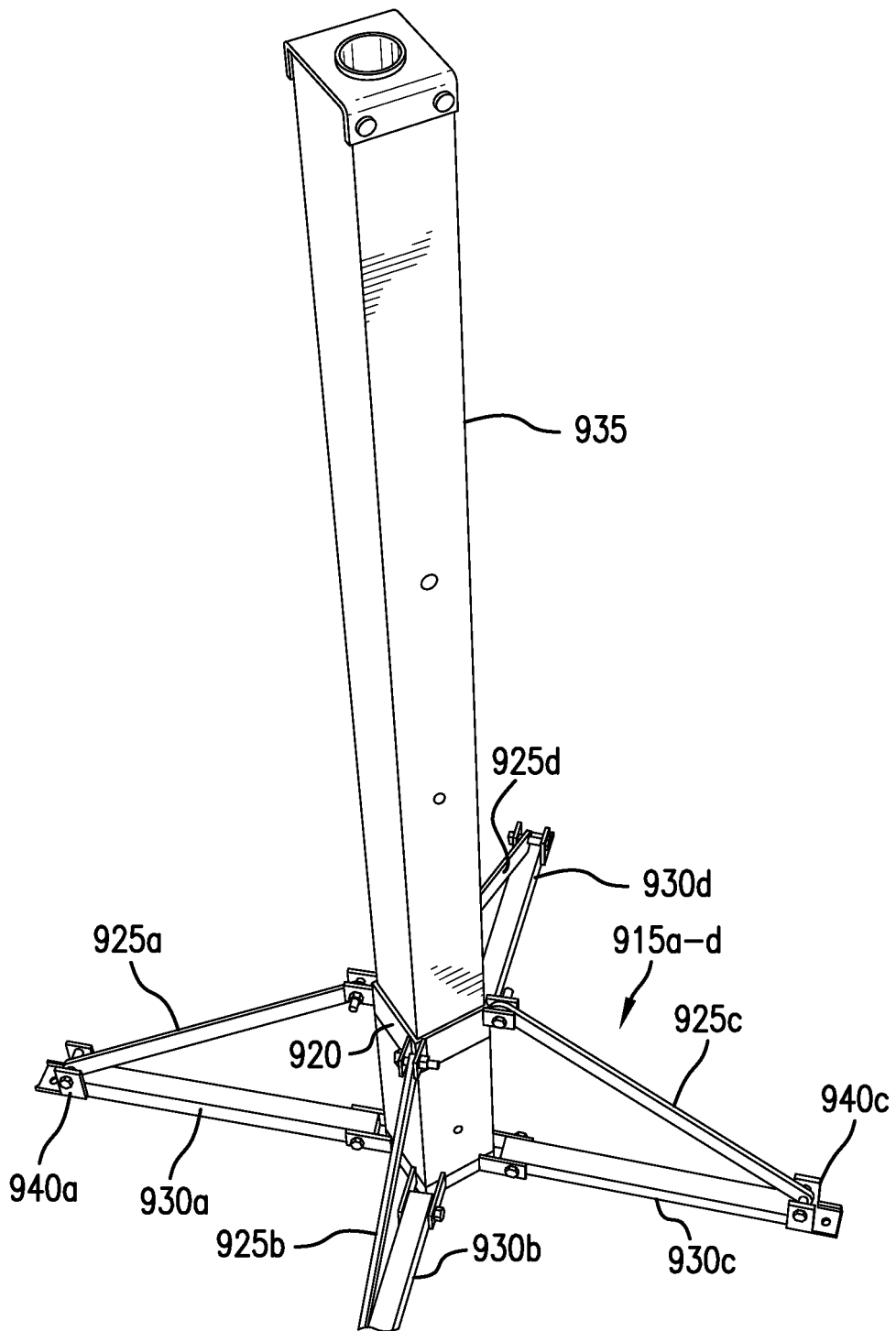


FIG. 9B

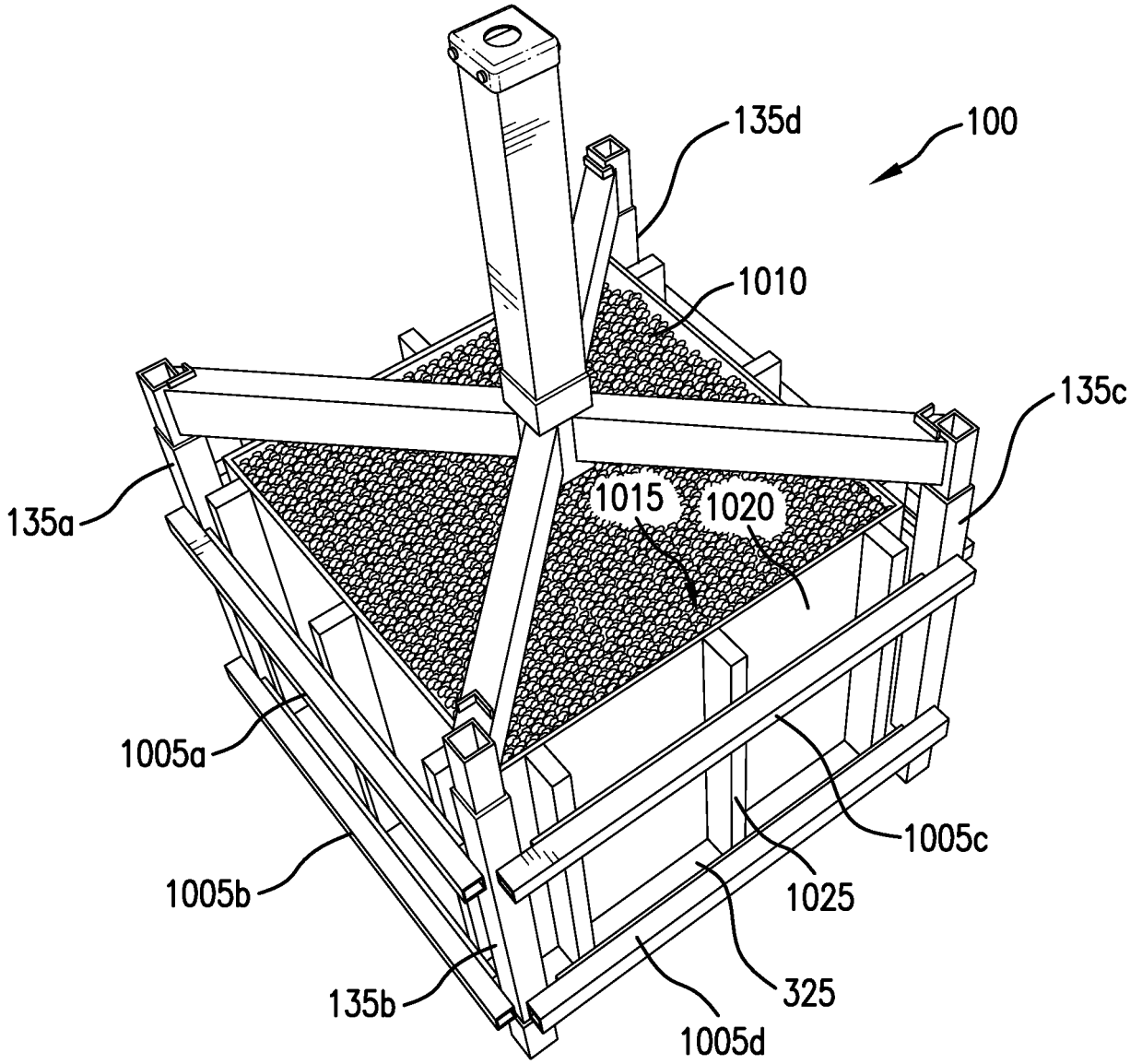


FIG. 10A

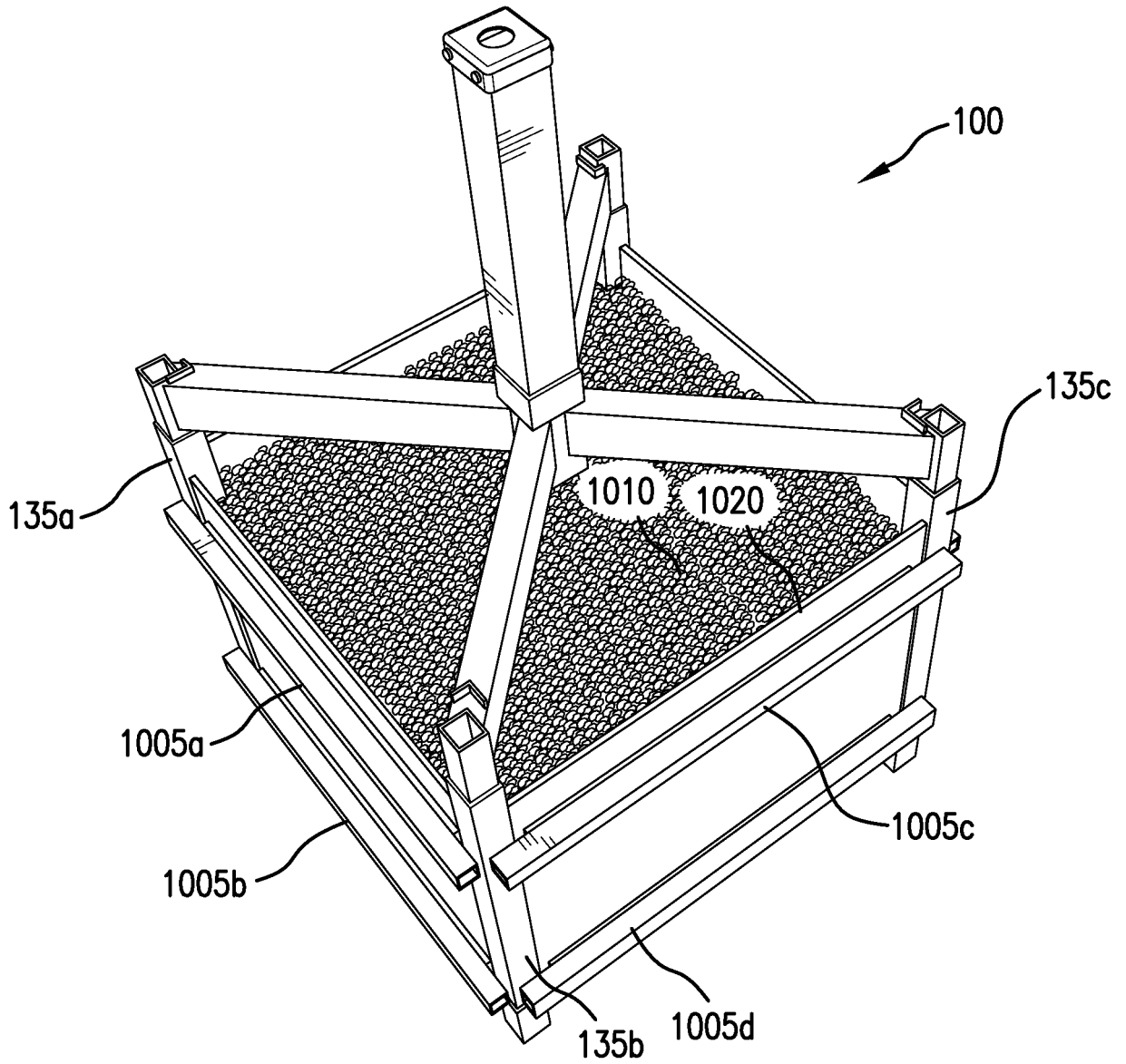


FIG. 10B

REFERENCES CITED IN THE DESCRIPTION

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